

THE LARYNGOSCOPE.

VOL. XXVII. ST. LOUIS, OCTOBER, 1917. No. 10.

ORIGINAL COMMUNICATIONS.

(Original Communications are received with the understanding
that they are contributed exclusively to THE LARYNGOSCOPE.)

A NEW METHOD OF WORKING OUT DIFFICULT MECHANICAL PROBLEMS OF BRONCHOSCOPIC FOREIGN-BODY EXTRACTION.*

DR. CHEVALIER JACKSON, Philadelphia, Pa.

The endoscopic removal of a foreign body that has no sharp edges or points to catch in the bronchial wall and that is not impacted is quite simple. On the other hand certain foreign bodies with long and sharp points or with acute angles may require much ingenuity to disengage them so that they become free to move and safe to make traction upon with forceps. To pull upon an entangled foreign body in either the bronchi or esophagus is to court disaster. If such traction be not fatal, as it usually is, ultimate removal is made much more difficult or impossible.

In this disentangling procedure when all previously made instruments had failed the author found it possible to solve the problem by means of probes and various forms of instruments bent and made to suit the purpose demanded by the mechanical problem presented in the particular case. In some cases it is possible to work out beforehand a curve or an angle that will do the work; in other cases it is necessary patiently to form and reform the end many times, testing each time, until the precise angle or turn or series of angles or turns is obtained to do the work.

The faults of stock instruments for this purpose are three. 1. They may be of not quite the proper shape. 2. They may have been subjected to too sharp bending which destroys the tensile strength of the steel. 3. If the shape is not exactly proper the instrument will not accomplish its purpose.

If the tensile strength has been impaired the instrument may break; because endoscopic instruments are necessarily delicate and

*Read before the American Laryngological, Rhinological and Otological Society, June 1, 1917.

the maximum tensile strength of the best tool steel (Stubb's) is none too great when reduced to the thread-like size needed for work in solving a difficult mechanical problem in the small bronchi of children. When the endoscopist himself works out an instrument he knows that it has not been subjected to strains of strength-impairing character. If such strains occur he should throw the steel away and start afresh.

The author's procedure when a difficult case is encountered, is to study over his previous cases of the same kind of foreign body; if, as is now usually the case, he has had to deal with similar foreign bodies. Next, a bronchoscopy or an esophagoscopy, as the case may be, is done, with all previously used instruments at hand for use if, on endoscopic study, they meet the requirements of the problem. If they do not, mental notes and measurements are taken and a

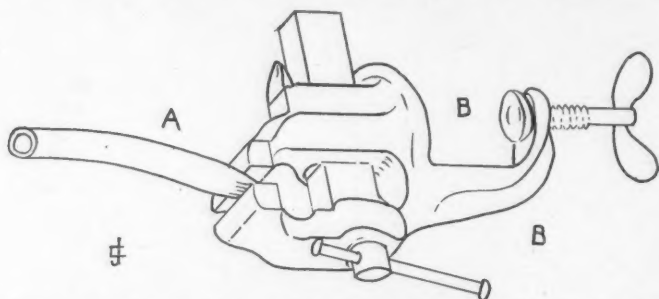
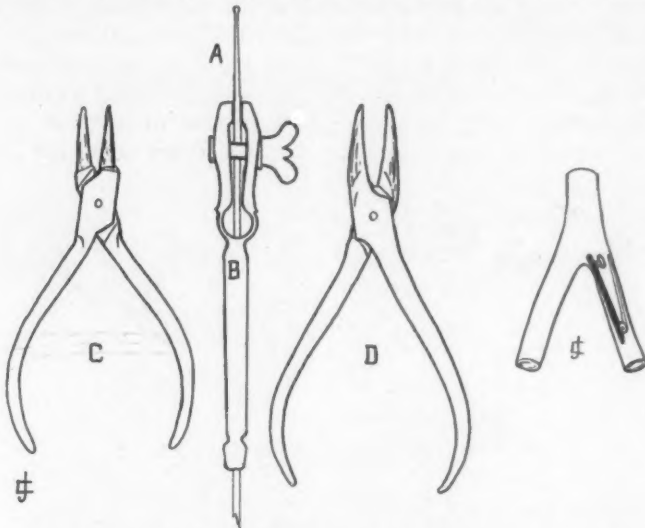


Fig. 1. A simple manikin for working out mechanical problems of foreign body extraction. Almost any problem can be stimulated.

series of probes or other instruments is made. These are tried out thoroughly on the work bench using a piece of rubber tubing for a manikin. One end of the tubing is anchored in a small vise which lies on the table, giving stability to the distal end of the tubing (Fig. 1). If the instruments will not enable the endoscopist to disentangle the foreign body in this manikin, obviously they will not enable him to do it in the living patient; and a continuation of careful, patient study is undertaken until the problem is solved.

Having solved the simulated problem on the manikin, the solution of the real problem in the patient is attempted, and usually with success. If unsuccessful a slight modification of the probes may succeed. This modification is made by means of the spirit lamp and the pliers (Figs. 2 and 4), which are sterile and ready on a sterile table in the operating-room. The instrument must be allowed to cool slowly. If chilled quickly, as by immersion in water,

the steel will be hardened and consequently made brittle. Cooling slowly anneals the steel. These slender instruments cool almost instantly. They should be, when finished, withdrawn slowly from the flame in an upward direction so that the heat after leaving the flame will prevent sudden chilling in the air. If some degree of spring is desired the finished instrument can be hardened "right out" by immersion in water when dull cherry red. Then the temper can be drawn to the degree desired by any one of a number



Figs. 2 and 3 and 4. Pliers for the bending of probes. The surfaces of the jaws are polished so as not to roughen or mutilate the probes in bending. At A is shown a probe-shaped steel rod, a number of which are prepared beforehand for shaping to suit the particular mechanical problem when encountered. The probe is shown held in a jeweler's hand vise for shaping. After removal from the vise, a handle is made by bending over to a right angle about 1 cm. of the proximal end.

Fig. 5. Glass tube used for demonstration of mechanical problems and sometimes for study of them.

of methods. This tempering had best not be attempted by anyone not thoroughly familiar with the procedure. Fortunately, tempering is very rarely required. For practically all purposes such as we are considering here, the annealed steel serves best. If the tool steel is of the highest quality it will have sufficient stiffness when annealed. Under no circumstances should work of this kind be attempted with wire, machinery steel, or iron.

On the tool table, in addition to the newly-wrought instruments, are a number of straight steel rods formed with probe-shaped ends

(Fig. 3) and a number of straight unwrought rods. These are for forming an entirely new instrument if desired, though this will rarely be necessary unless the position of the foreign body has shifted, thus changing the mechanical problem. Such shifting rarely occurs in the class of cases here considered.

The probes (Fig. 3) are made by filing in a watchmaker's lathe. Of course, they can be made up in quantities at the instrument-maker's, but those made from the steel rod by the endoscopist himself inspire the most confidence. They can be filed to shape while being held in a hand-vise, if no small lathe is at hand; but the lathe-made probes are more quickly and conveniently wrought to shape. In the solution of some problems a flattened or a squared cross-section on the end of the probes is advantageous. In this

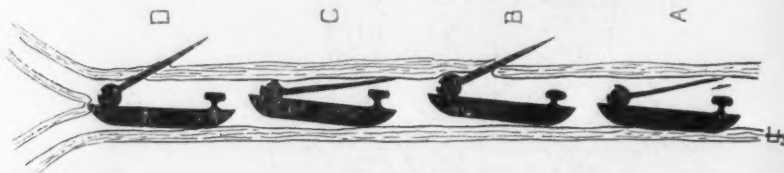


Fig. 6. Schema showing how a bar pin was pushed down by ill-advised alternate pushing and pulling until it had been forced into the lowest possible position. Complete perforations as at B and D are usually fatal.

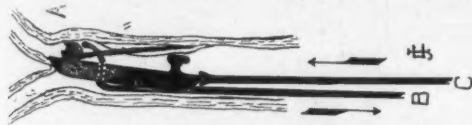


Fig. 7. Schema illustrating a new method of closing a bar-pin.

case the cone of the lathe is locked at the proper position and accurate filing can be done. The most convenient form of handle, it has seemed to the author, is the simple right-angle bend shown in Fig. 3. This is always made last and is turned so as to be opposite the bend formed on the distal end; so as to be in all instruments in the same relation. By this means the position of the probe-end is always in mind.

In forming probes for the purposes herein mentioned it is necessary to see that they are not hooks; that is, that they do not approach too closely to a right angle. A more or less obtuse angle or an approach to spiral form will always permit them to be withdrawn by backward rotation. To have an instrument so entangled as not to be able to disengage it would be a serious or possibly fatal predicament, as reported by Hubbard in the use of a snare.

Great caution is necessary in the use of these bent probes and the utmost delicacy of the sense of touch must be exercised, as it is very easy to perforate the bronchial wall with either the probe or the foreign body.

TOOLS.

The tools needed for this work are mainly those of the jeweler, not those of the blacksmith or machinist. Extreme delicacy and precision are essential. Lack of these will result in either a clumsy instrument or one with weak places.

Lathe. A good precision lathe is essential, and it must be deli-

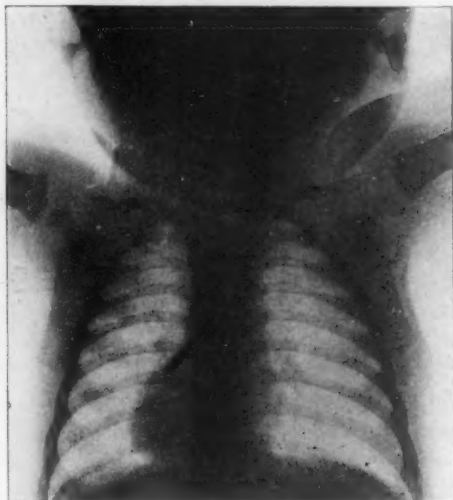


Fig. 8.

Fig. 8. Radiograph showing bar pin in left bronchus of four months old infant.



Fig. 9.

Fig. 9. Bar pin removed bronchoscopically from the left bronchus of an infant of four months.

cate. The Webster-Whitcomb jeweler's lathe is a standard quality. It should have a full assortment of chucks and attachments. In passing it may be said that the mastoid curettes of the otologist can be sharpened from the inside of the bowl by a carborundum burr held in this lathe, so as to cut in a way that will seem incomprehensible to those used to dull curettes.

Work-bench. A firm, solid work-bench at a window where good bright daylight may be had is essential.

Vise. A small jeweler's bench-vise is needed. It should have detachable leather facings for the jaws so as not to roughen the

probes when they are held after finishing. In the rougher part of the work the more accurate holding of the bare jaws is needed. The common cast-iron visé is a mere toy and will not serve. A small hand-vice or a jeweler's pin-vice is also needed.

Files. A set of jeweler's needle files are the best for this delicate work. They are made of twelve different forms of cross-section.

Pliers. Square-nosed, round-nosed and pointed, flat-nosed pliers are needed. Two sets are essential; one set with roughened jaws for the roughing-out, and one set with absolutely smooth and polished jaws for bending the finished probes. The pliers used by opticians for fitting spectacle frames are best for the latter purpose. A pair of heavy cutting pliers are convenient for cutting off the probes, or other instruments, to length.

Anvil. A jeweler's anvil is very convenient as is also a bench-block of faced and smoothed cast-iron, for straightening rods, etc.

Polishing tools. A good jeweler's motor with carborundum grinding wheel and a buffing wheel is very convenient. Emery cloth of finest grain and rouge cloth are needed for hand-smoothing and lathe-finishing. A high polish is objectionable, but the instruments should be smooth. They may be blued after finishing by heating in the bunsen flame. The dark blue instruments of dull finish are more easily seen.

Alcohol lamp is convenient because it can be sterilized and placed on the tool table in the operating-room for bending probes. For use in the workshop the bunsen gas burner may be used.

Manikin. The manikin of Killian was made to teach introduction of the tubes. It was for use in the sitting position. The manikin of Von Schrötter was for teaching introduction in the lateral position. Hubbard has made an excellent manikin for use in simulating the recumbent position. The author uses for the working out of mechanical problems a bit of drainage tubing about 20 centimeters long, the distal end being held in a small cast-iron vise that can be purchased for 25 cents at any hardware shop. In use it is not fastened to the bench, but allowed to rest on the bench, desk or table. Much practice may be had with it at odd moments. For demonstration of mechanical problems, and sometimes for study of them, a glass tube is used, Fig. 5.

Other tools. The other tools that are convenient and that the mechanically-inclined endoscopist can and will naturally add to his workshop are too numerous to mention. Saws, drills, reamers, screw-plates, taps, dies and so on *ad infinitum* can be used with

pleasure and profit by those who naturally turn to such work as recreation. But it is not for such that this article is written. It will not pay the busy bronchoscopist to make his own instruments for general work. There are some instruments, however, such as those hereinbefore described that he can make for the particular case that will enable him to get out a foreign body that otherwise he will never get out.

ILLUSTRATIVE CASE.

Infant, aged 4 months, aspirated a bar pin, to remove which two attempts had been made, first under ether anesthesia, next under

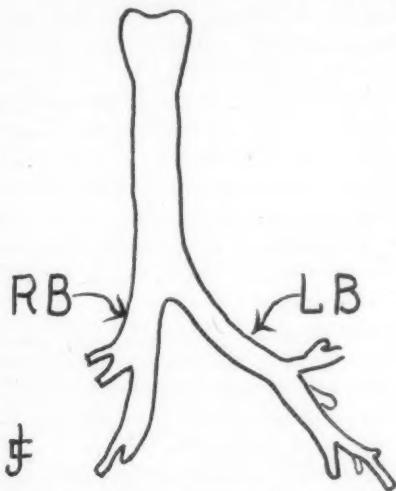


Fig. 9. Cast of the trachea, main bronchi and stem bronchi, of an infant one year old. Actual size. Note the size of the main bronchi; no larger than a large straw.

chloroform. Tracheotomy had been done as stated by my predecessor in the case (who has since urged me to make this publication of it) for the combined reasons that (a) the first bronchoscopy was followed by subglottic edema; (b) the pin was supposed to be in the cervical trachea reachable by tracheotomy; (c) this failing, removal could be accomplished by bronchoscopy through the tracheotomic wound. These procedures all failed, however, and the child was brought to our clinic. Temperature, 104.3; pulse, 158; respirations, 52. The breath was foul, the lips were cut, sloughing shreds of mucosa were visible in the pharynx. Muco-pus was streaming down the neck from the tracheotomic wound in

which was an over-sized aluminum cannula full of crusted secretions. The child was pale and very fretful. It moaned almost constantly and slept but little. We did not expect it to live longer than a few hours; and in consultation with my predecessor in the case it was decided that nothing was to be done but to try to get the child to rally. It was clear that it was suffering from surgical shock and sepsis, not from the pin. Contrary to our expectations, the child lingered along for a few days and then slowly began to improve. At the end of three weeks the temperature was almost normal and the child was in fairly good condition. There was a loose cough, dullness over the left lower lobe, which was full of rales. A radiograph showed imperfect drainage from the left lower lobe. The bar pin was seen to be in the left bronchus about 6 millimeters below the bifurcation.

Without anesthesia, the 4-millimeter bronchoscope was passed through the mouth. There were patches of exudate in streaks on the tracheal wall. Pus filled the left bronchus, and no air seemed to be passing in or out of the left bronchus, whose walls were so swollen that the end of the pin was hidden from view. The pin was apparently wedged fast. It was thought best not to make any attempt to work with it for a time, for both local and general reasons. Meanwhile a method of removal was to be worked out in the bronchoscopic laboratory.

It was quite clear from the statements of my predecessor and from endoscopic inspection of the case that what happened was this: As shown schematically in Fig. 6, the bar pin had been at first lying loosely in the trachea, as shown at A. Traction resulted in causing the pin-point to enter the tracheal wall as shown at B, preventing withdrawal. To liberate the point, the pin had been pushed downward to a new position (c) where traction again caused the point to enter the bronchial wall. This had been repeated until the pin was forced down tightly as far as it could go in the small stem bronchus of a 4 months old infant, and there anchored with what seemed utterly hopeless tightness. Of course some such ratchet-like action downward occurs from cough and even respiration; but my predecessor nobly took the blame upon himself, claiming that the intruder if unmolested could not have arrived at such a condition of impaction and anchorage. The greatest difficulty arose from the fact that the forcing in of the pin together with the edema left no room at the side of the pin to work. Any instrument inserted would need to make room for itself by displacing the edema and the utmost care would be necessary to prevent perforation of

the bronchial wall by the instrument or the foreign body. In addition to this it should be remembered that the stem bronchus of a child of this age is not over 3 millimeters in diameter. (Fig. 10.) It seemed as though bronchoscopy had once more encountered the impossible. To pull the intruder out at all hazards would certainly have been promptly fatal, and was not to be considered for a moment.

The method finally worked out on the manikin is shown schematically in Fig. 7. The fine, bent probe, B, was formed to the proper curve to be insinuated by rotation to the position shown. Then by gently turning the bent probe, at the same time making gentle pressure with the fixing push rod, C, the pin was closed. This rendered forceps withdrawal safe and not difficult. No anesthetic general or local was used. The child made a good recovery and has remained entirely well.

Part of the inconceivable difficulty here presented was in the small size of the trachea and bronchi in an infant of four months, coupled with the limited time that it is safe to continue working. The main bronchi are not larger than a goose quill and to stretch them by forcing in a large tube is certain death. The lumen diameter at four months of age is not more than half what it is at twelve months.

My predecessor in this case asked that mention of his name be omitted in order that I might feel absolutely unhampered in fully stating the case so that others might avoid committing the error of pursuing a foreign body downward.

For use in the esophagus, forceps may be substituted for the fixing rod.

CONCLUSIONS.

1. Tool-steel probes formed by the bronchoscopist himself, to suit the particular case, are an addition to our means of solving mechanical problems of bronchoscopic foreign-body extraction.

2. The form herewith shown can be used to close a bar pin, which cannot be done with any of the different forms of safety-pin closers.

3. To pursue a foreign body downward is to court disaster.

4. Care is necessary to avoid forming hooks that could catch in bronchi or become entangled in the foreign body. The shape should be such as to favor "unscrewing" out if caught.

5. Great care should be taken to avoid injury to the patient. Any number of trials may be had if no harm be done. One serious trauma may terminate the case.

tating and fatal if not removed at the first trial. The average duration by actual time in minutes has been from five to eight minutes in children. The bronchoscopic tube may, however, be left in situ with no apparent discomfort to the patient for a period of fifteen minutes after spraying or swabbing with antitoxin. The children breathe with perfect ease and often fall asleep with the bronchoscope in situ after the obstruction is relieved. In adults the duration may be prolonged but the general condition of the patient should be taken into consideration as well as the amount of involvement of the bronchus.

In the removal of the membrane by suction or forceps great care should be taken not to cover the attached portion of the cast with the lip of the bronchoscope but to locate the uppermost part of the attachment of the membrane and follow it down to its distal attachment. I have had this difficulty arise where I could see the flapping piece of membrane which, being held to the tracheal wall by the tube, was difficult to detach *en masse*. The membrane ordinarily is stripped off from the tracheal and bronchial wall readily but in the instance I mention I had some difficulty by overriding the proximal attachment of the membrane by the lip of the tube.

In compiling statistics on these cases I have recorded all of the cases handled by the House Staff or myself even though they succumbed within a period of from 12 to 24 hours after admission. This, of course, greatly increases the mortality rate, but it is only fair to report the good results as well as the bad and then deduct the 12 to 24 hour cases showing what may have happened had the cases not been of such long duration or if they had been recognized early.

Of the case reports I have 11 to add during the years 1915 and 1916. One adult was admitted to the Willard Parker Hospital with tracheobronchial diphtheria who recovered. All of the others were children from one year to 7 or 8 years of age. Of the eleven cases treated six recovered and were discharged cured. Five died, three of them being in moribund condition on admission. One died one hour after admission, another within twelve hours, and a third in seventeen hours. The other two died from extensive pneumonia fifteen and twenty days after the removal of the membrane. The pneumonia developed in one case after the temperature had reached normal on the seventh day and the child was without the tube. Deducting the cases that died within the first twenty-four hours would make a very encouraging recovery rate 75 per cent, but we do not deduct any case in whom

intubation has been performed or in whom bronchoscopic examination has been made, and therefore the high mortality rate with such cases inclusive is rather discouraging. Following is a brief report of the cases:

Case 1. A. W. A woman 35 years old, ill five days, was admitted to the Willard Parker Hospital January 10, 1915, suffering with laringotracheal diphtheria. On admission the woman was in poor condition, markedly cyanotic and suffering from extreme dyspnea. She was promptly intubated with an adult intubation tube by Dr. Archibald Dickson, the resident physician, and the stenosis was temporarily relieved. Within a short time the tube became obstructed and was removed and a small cast of membrane followed. As the coughing up of the cast apparently relieved the stenosis, reintubation was not necessary and the patient breathed fairly well for one hour but gradual stenosis necessitated reintubation. During the interval that she remained without the tube a physical examination of the chest was made and a dose of 40,000 units of antitoxin administered. The physical examination was rather unsatisfactory owing to the very thick chest wall of the patient who weighed about 230 pounds. However, Dr. Dickson thought there was diminished respiratory murmur over the right lung in comparison to the left and that bronchoscopic examination was indicated. None of the other members of the house staff or myself were able to corroborate the findings of Dr. Dickson on physical examination, but the bronchoscopic examination proved that Dr. Dickson was the only one of us who was correct. The tonsils and pharynx were covered with membrane. The arytenoid cartilages were enormously swollen and the right one covered with a thick exudate. The vocal cords and ventricular bands were beefy red, the right cavity of the larynx being covered with membrane and the left free where the cast had possibly been removed by intubation. The 7 mm. bronchoscope of Dr. Jackson was introduced, as the 9 mm. tube would have been too large to pass into the larynx without causing much traumatism. On introduction of the bronchoscope a well defined cast of membrane was visible on the right antero-lateral tracheal wall extending downward. This was promptly removed by suction and the tube passed downward until the carina came into view when the membrane was seen in the right bronchus. This piece of membrane was also removed by aspiration but the suction tube became obstructed and another was substituted. The extension of the cast continued into the superior lobe bronchus and also as far down as the middle lobe

orifice but did not enter it. All of the membrane was removed from the superior lobe as far as I could see. The mouth of the bronchus was much swollen. A suction vacuum of ten inches was used. The bronchial area was swabbed as well as possible with antitoxin. While swabbing with antitoxin the nurse did not tighten the sleeve on one of the Coolidge sponge holders and the gauze sponge became detached on removal and we had a foreign body added. The gauze fortunately became lodged in the mouth of the swollen bronchus and was removed. Application of antitoxin was made to the trachea and larynx and a long 13 cm. intubation tube introduced. A dose of morphia gr. $\frac{1}{4}$ and atropia gr. 1-150 was administered one-half hour before bronchoscopy. No local or general anesthetic was used. Although cocain was not used I do not think it was contraindicated. The duration of bronchoscopy was thirty minutes and the tube was left in situ for fifteen minutes longer to allow for free breathing and to remove mucous and insufflated oxygen. The patient apparently suffered from little shock and had a fairly comfortable night. The following day the temperature was 103.2° Fahrenheit, pulse 110, respiration 38. The tube was removed four days later and on removal of the tube through the direct speculum a mass of curdy digested membrane was coughed out. The larynx was free from membrane but considerable ulceration remained. No subglottic edema was noted. The tube was not replaced. The temperature gradually reached normal on the tenth day and the patient was discharged from the hospital one month later. The voice was very hoarse at the time of discharge from the hospital due to an infiltrated and fixed cricoarytenoid joint on the right side. The patient insisted on leaving the hospital and going to Atlantic City even though we advised her to remain in the city for fear of return of the stenosis. Dr. Dickson saw her three months later and reported that the arytenoid was moving and the voice was returning to normal. There were no complications. All of the cultures were positive.

Case 2. W. J., 8 years of age, ill five days, was admitted to Riverside Hospital January 28, 1915, for post-nasal, glandular and laryngeal diphtheria. The ambulance surgeon who brought the boy to the hospital did not consider intubation necessary and thought the whole trouble was due to obstructed pharyngeal croup from the enormous amount of swelling of the neck and face. A careful physical examination was made by Dr. E. M. Goldstein on admission and he noted the supposed enormous collar of brawny cellulitis to be due to subcutaneous emphysema. The

neck and face were enormously puffed out with air and the ocular and palpebral conjunctivae of the left eye stood out as a large air bubble. There was but slight exudate on the tonsils but the uvula was gone and was thought to have sloughed off, but a history from the parents the following day cleared up this error. The tonsils had been removed and the uvula was probably removed with them; however, there was not sufficient exudate present to account for such clean amputation of the uvula and part of the posterior pillar of the right side.

There was a peculiar inspiratory-expiratory wheezing accompanied by a cough which was not sufficiently constricted to require intubation. The heart action was rapid but regular. A dose of 10,000 units of antitoxin was administered, 5,000 units having been administered prior to admission by the family physician.

On the 29th, the second day after admission, the emphysema and stenotic symptoms had markedly progressed and intubation was resorted to in order to relieve the condition. Dr. E. M. Goldstein, Resident Physician of Riverside Hospital, intubated by the O'Dwyer method with an 8-9 tube. The intubation instead of relieving the stenosis made it much worse and the patient was almost asphyxiated. The tube was at once removed and following it a cast of membrane was coughed up. He notified me of the condition and on arrival at the hospital I made a thorough physical examination of the patient. The boy was terribly puffed with emphysema and breathing was decidedly asthmatic. The emphysema was found to extend over the entire trunk down to Poupart's ligament. The arms and hands were also ballooned with air. The pharynx showed a thin exudate on the tonsils, the uvula was gone. The same exudate was in the laryngo-pharynx. A direct laryngeal examination showed the epiglottis to be free of exudate, nor was there any exudate on the ary-epiglottic folds. The arytenoids were enormously swollen but free from exudate. The ventricular bands and vocal cords were plainly visible, free from membrane but congested. There was apparently marked subglottic infiltration.

A 5 mm. bronchoscope was introduced and small patches of membrane and ulceration were seen below the cricoid extending down into the right main bronchus. Both bronchi were examined but no casts of membrane were seen and the exfoliated cast which had been coughed up was unquestionably the cause of respiratory difficulty. Re-intubation was not necessary.

The case is interesting from the standpoint of subcutaneous emphysema occurring in a case prior to instrumentation of any kind and I was at a loss to explain the cause of the emphysema. The boy had a rather slow convalescence due to myocardial changes and post-palatine paralysis but eventually recovered. The cultures taken were all positive.

At an autopsy which I was able to obtain in a foreign body case other than diphtheria with similar symptoms and subcutaneous emphysema I endeavored to give an explanation of the cause of such subcutaneous emphysema without instrumentation which was as follows: Rupture of the blebs through the pleura into the mediastinal spaces which in turn follows the deep cervical fasciae, and gets out into the subcutaneous cellular tissues of the body was the only plausible explanation for this condition. (See THE LARYNGOSCOPE, August, 1915, p. 574.)

Case 3. M. W. Age 20 months, ill three days, was admitted to the Kingston Avenue Hospital May 16, 1915, intubated for laryngeal diphtheria. The child was in extremis on admission and the tube was obstructed. Dr. Eberle removed the intubation tube but as there was no expiratory cough and it was very evident that the child was about dead, Dr. Eberle rapidly performed tracheotomy and removed a cast of membrane which had caused asphyxia. By means of artificial respiration the child began to breathe but this was followed by a series of convulsions and the baby succumbed one hour later. Although the heart continued to beat during the respiratory failure the profound carbonic acid poisoning was not overcome. Dr. Eberle performed a necropsy and found both bronchi obstructed by membrane.

Case 4. T. H. A boy of three years, ill 3 days, was admitted to the Kingston Avenue Hospital October 3, 1915, intubated for laryngeal diphtheria. On admission the child was in fairly good condition though there was some difficulty with respiration at times and a persistent cough. As the ambulance surgeon said there was immediate relief of dyspnea after intubation, which was apparent on admission, Dr. Thos. Joyce thought the persistent cough was due to the presence of the tube in the larynx to which the larynx had not become tolerant. There was no membrane visible on the tonsils or pharynx. A dose of 20,000 units of antitoxin was given. Two hours after admission the child became very restless and cyanotic and Dr. Joyce was hurriedly sent for who removed the tube and found it plugged with membrane. A longer tube was immediately reintroduced which gave the desired

relief and the child on return to his crib went to sleep. Within an hour the tube again became obstructed and was again removed and found to be full of membrane. As I was in the hospital at this time Dr. Joyce called me to see the child who, after the third intubation, was apparently comfortable but was slightly cyanosed. On examining the lungs little air was heard entering either side and the little patient was apparently breathing with great care in order to avoid further trouble. From the history given by Dr. Joyce and the physical findings preparation was made for bronchoscopic examination which seemed to be indicated. The temperature was 102.04° Fahrenheit, pulse weak and rapid and respiration shallow. On removal of the tube the larynx was free from membrane. The 4 mm. tube was passed and immediately ran into a cast of membrane in the trachea; it became obstructed and was promptly removed. The 5 mm. tube was introduced rapidly and also passed into the cast but was withdrawn above the cast, aspiration was applied and a cast was withdrawn hanging to the end of the canula. This was pulled off by one of the nurses and the canula again applied. From the cricoid level downward as far as one could see there was a complete cast of membrane. At times the loose piece would temporarily obstruct vision by flapping into the lip of the tube and covering the light. Two small pieces were coughed through the lumen of the tube and stuck on the operator's mask. It was impossible to remove all of the membrane at one sitting so we decided to discontinue the procedure after we had worked for fifteen minutes and to give another dose of antitoxin, later removing the remainder of the membrane after the antitoxin had had its effect. The bronchoscopic tube was, however, left in situ for fifteen minutes longer to allow for free breathing followed by swabbing and intubation with a long tube. The child apparently was in fairly good condition when he returned to bed and, as he had had 1-32 of a grain of morphia, fell asleep. The same evening the child became very restless and the temperature rose to 105.2° Fahrenheit. There was difficulty with respiration and Dr. Joyce removed the tube. Respiration was much improved on removal of the tube but no membrane was coughed up. Within one and a half hours reintubation was again necessary. The unfortunate little soul was about exhausted by this time and the lungs began to fill with bubbling moist rales. The condition continued to grow worse and the child died from pulmonary edema just twelve hours after admission. No autopsy was permitted.

Case 5. W. Z., age 4 years, ill four days, was admitted to the Kingston Avenue Hospital December 19, 1915, intubated for laryngeal diphtheria. There was no relief following intubation for the tube became obstructed and was removed. Further intubation did not improve the condition and Dr. Laub promptly performed tracheotomy, removing a cast of membrane from the trachea by means of forceps and then introduced a tracheal canula. The patient's condition improved after the removal of the membrane and there was free passage of air through the tracheal canula; 20,000 units of antitoxin were given and the child put in bed. The usual stimulation of camphor in oil was given. The child continued to do fairly well for about twelve hours after tracheotomy when a piece of membrane was coughed into the tracheal tube causing obstruction. The tube was promptly removed by the nurse and a cast of membrane followed. The tracheal canula was reintroduced by the house physician who responded to the call. From this time on the child continued to grow worse and become cyanosed. The heart sounds were weak and rapid and the lungs were gradually filling with moist rales. Repeated doses of adrenalin were given but no amount of hypodermic stimulation had any effect. The unfortunate little boy lingered in this condition for five hours and then passed away just seventeen hours after admission.

Case 6. Domonick, age $2\frac{1}{2}$ years, ill two days, admitted to the Kingston Avenue Hospital March 23, 1916, was intubated shortly after admission by Dr. Hook, with a 1 year O'Dwyer tube. This tube gave the relief desired and the little patient improved. A dose of 15,000 units of antitoxin was administered. The child had a fairly comfortable night but the following morning he was breathing with difficulty. The tube was removed and was followed by a cast of membrane and much bleeding. Dr. Regan gave a dose of horse serum 30 cc. intramuscularly and the record states that the hemorrhage promptly ceased. There is not a great deal of bleeding as a rule in these cases where the membrane is attached to ciliated epithelium but there are exceptions however and this was probably one of them. The child was reintubated with a 2-year tube ten minutes later. As reintubation did not seem to relieve the dyspnea Dr. Joyce notified me of the condition and on arrival at the hospital the same afternoon we bronchoscoped the patient.

There was no visible membrane on the tonsils or the pharynx as the speculum was introduced. There was no membrane visible on

the epiglottis. The larynx was congested and ulcerated, and the hemorrhage recorded probably came from this region. Ulcerated areas were noticed on the passage of the 4 mm. tube which extended downward into the right main bronchus at which site there was a visible membranous cast loosely attached which would flop into the lumen of the bronchoscope with expiration, only to be aspirated into the bronchus with inspiration. With a small suction canula the proximal end of the membrane was readily attached to the tube and a cast of the main bronchus removed with a torn and shreaded distal end. The bronchus was then examined for further membrane but none was visible below the upper lobe bronchus though the lip of the bronchus was considerably infiltrated. After the removal of the membrane the usual procedure of swabbing by antitoxin was used and a long tube introduced. On March 26, the tracheobronchial intubation tube was removed but reintubation was necessary four hours later, a 2 year O'Dwyer tube being introduced by Dr. Joyce. On March 31 the tube was auto-extubated, the same size tube being replaced. The child was in poor condition. There were scattered subcrepitant rales over both lungs posteriorly. The child continued to cough up the tube on an average of one to three times during the day but as soon as a 2-year, non-cough-up tube was introduced the condition was relieved. On April 2, the right side of the face became swollen and on oral examination a small necrotic ulcer (cancrum oris) was noted in the right buccal cavity. Smears from the ulcer showed Vincent's bacillus and spirillum in abundance. The area was treated locally with pure carbolic acid and alcohol, no salvarsan being obtainable. The oral condition continued to progress rapidly so that necrotic slough was removed by curettage and the area again painted with phenol. The unfortunate little boy continued to grow worse and the area of gangrene increased. The tube was removed for cleansing as there was marked and fetid salivation with a continual flow from the mouth as well as into the lumen of the intubation tube which caused excessive coughing at times. On April 6, a purpuric rash developed on the face and chest, septic in origin. A blood count at this time showed a general count of 15,000 with a poly morphonuclear count of 92 per cent. A blood culture, made with some difficulty by Dr. Eberle owing to the very small veins, showed a hemolysing streptococcus.

The child continued to grow worse and died on April 12, 1916, still wearing the intubation tube. Although the foreign body obstruction was removed early in the disease the many complications

which are apt to follow in these cases makes the ultimate outcome extremely discouraging.

Case 7. Robt. N., age 3 years, ill two days, was admitted to the Kingston Avenue Hospital April 1, 1917, intubated before admission with a 3 year O'Dwyer tube. The child was breathing poorly on admission and Dr. Joyce, who admitted the case, also noted on physical examination that little air was entering the right lung. There was no membrane visible on the tonsils. A dose of 20,000 units of antitoxin was administered. As the dyspnea gradually became worse and the child very restless and cyanosed. Dr. Joyce removed the tube. No membrane followed the removal of the tube but the patient was much more comfortable and breathed with little difficulty. It is not at all an uncommon occurrence to have a child breathe easier without the tube especially when the end of the lumen of the tube is covered by a loose piece of membrane. About six hours later, owing to gradual contraction, reintubation was necessary, a longer tube being introduced by Dr. Joyce which seemed to pass the obstruction and give the desired relief. The child remained fairly comfortable with the long intubation tube in situ until the following morning when dyspnea and cyanosis became marked and the tube was promptly removed. With the removal of the tube the distal end was found completely obstructed with thick curdy material, probably digested membrane. The child again remained without the tube and breathed much better after its removal, but later reintubation was necessary, the short 3-year O'Dwyer tube being used. When I saw the child the same afternoon there were definite signs of obstruction below the tube, viz., prolonged inspiration and shortened expiration, accompanied by the ever present blocked cough. There was diminished respiratory murmur over the upper lobe of the right lung; the left which was perfectly free although the respiration was exaggerated. There were few rales. The temperature was 102.4° Fahrenheit, pulse 128, respirations 38 and labored. There was moderate cyanosis.

On direct inspection the tonsils were free from membrane. The epiglottis was not involved but the arytenoid cartilages were red and swollen, which could be accounted for by the frequent intubations. On removal of the tube the larynx was seen to be congested and the ventricular bands and vocal cords red and swollen. There was no membrane visible. The 5 mm. tube of Dr. Jackson was introduced which promptly encountered membrane, moving to and fro with every respiratory effort, in the trachea. With the small aspiration tube and a vacuum of from five to ten inches the membrane was re-

moved, the attachment being made at the loose distal extremity, care being taken to see that the cast was not held by the lip of the tube to the tracheal wall. With suction a cast, $3\frac{1}{2}$ cm. in length, which was part cylinder and torn cast was removed. The main bronchus and also the upper lobe and stem bronchi were examined, but aside from small areas of ulceration no further membrane was seen. The ulcerated areas were swabbed by the usual antitoxin gauge sponge. A long intubation tube was introduced. The temperature rose following the manipulation which had been by the watch exactly eight minutes, but the child was breathing much more comfortably and soon was asleep. The following day Dr. Joyce reported that there were many scattered rales over the right upper lobe of the lung involved but that the child was fairly comfortable and taking nourishment well. The temperature remained high, 104.2° Fahrenheit, and the pulse and respiration rapid. On April 5, the long tube was removed by direct detubation and much curdy digested material followed the removal. The child did only fairly well without the tube for thirty minutes when reintubation was necessary the O'Dwyer tube being introduced. The temperature fell to 101° Fahrenheit the day following the removal of the long tube and reached normal by the end of the week. A second attempt was made to remove the tube by direct means but reintubation was immediately necessary owing to the swollen arytenoids. On April 10, the child was in remarkably good condition but was still unable to remain without the tube. There was not sufficient subglottic infiltration to cause the immediate reintroduction of the tube and therefore the larynx was not cauterized. There was marked adductor spasm, which could be plainly seen, both of the ventricular bands and cords. Such spasms are most frequently the cause of false passages and are even met with to-day when forcible attempts to intubate are made by the hand of the unskilled intubator. Like all spasms encountered in laryngeal or esophageal tubage the operator who waits for the spasm to relax will do no harm to soft parts, but the over-anxious beginner who is anxious to put his first tube in the larynx, frequently uses such force in the attempt at intubation that he not only ruptures the soft parts and makes a false passage into the mediastinum which invariably has as a sequel to his faulty manipulation a fatal termination from mediastinal pneumonia.

We, therefore, wait for the spasms to relax, especially when the tube is inserted under the direct guidance of the eye, thereby avoiding traumatism and the fatal false passage. Although we had cured

the patient of the acute diphtheritic condition we were unable to remove the tube for any length of time. On April 21, the tube was removed and as no immediate spasm followed the child was returned to the crib, breathing well without the tube. This was very encouraging and we thought that at last the child would remain permanently detubated, but such was not the case as Dr. Joyce reintubated him four hours later. We then decided to leave the tube in for one week before disturbing it, for the child had become extremely nervous and frightened at the many attempts at the removal of the tube. On April 28th, the tube was again removed by direct means but the inevitable reintubation had to be done a few hours later. Dr. Joyce, who had given the little child such constant attention, thought that the direct detubation may be the cause of the trouble as the child had become frightened by so many direct examinations and furthermore he argued that even though the removal took not over a minute, the instrument may be the cause of supraglottic edema which I had not seen as I had invariably left the hospital before reintubation was necessary. He therefore suggested that he take the tube out some morning early by the O'Dwyer method and see what happened. He accordingly removed the tube on May 1, and reintubation was not necessary. The child made a perfect recovery. The patient was detained in the hospital for one month after the last removal of the tube to make doubly sure that there would be no recurrent stenosis. He was discharged cured May 31, 1916. This case is interesting from the standpoint of frequent direct examinations being the cause of supraglottic edema as suggested by Dr. Thos. Joyce of the Resident Staff. No doubt, prolonged direct examination will cause this condition and does cause supraglottic and arytenoid edema much more often than we suppose; but here is a case with supraglottic and arytenoid edema when examined for not over one minute at any sitting. Most of our cases have been cured after direct methods were resorted to but this case was the interesting exception and was only permanently cured after the skillful digital removal of the tube by Dr. Joyce.

Case 8. Martin S., age one year, ill three days, was admitted to the Kingston Avenue Hospital March 28, 1916, suffering from laryngeal diphtheria. The throat was congested but there was no visible exudate on the tonsils. The child was able to cry, showing that there was no involvement of the larynx, but there was marked retraction at times. A dose of 15,000 units of antitoxin was administered, 5,000 having been given just prior to admission to the hospital. The little child had spells of marked dyspnea and eight

hours later, on account of the pulse becoming aspirate, that is, disappearing with each inspiration, the child was intubated, a 1-year tube being used. After intubation the respiratory difficulty became worse and the tube was promptly removed and a longer tube inserted by Dr. Adam Eberle, which gave temporary relief. Within two hours this tube became obstructed. It was removed and a small piece of membrane followed. The child breathed much better without the tube for over one hour when respiration again became difficult and reintubation was performed with the long one-year tube. On arrival at the hospital a physical examination was made. There was marked retraction even with the tube in situ. Little air was entering the right lung and by inspection the right chest was barrel-shaped. The intubation tube was removed and the 4 mm. bronchoscopic tube of Dr. Jackson introduced. No membrane was visible in the congested larynx, but on introduction of the bronchoscope membrane was plainly visible and very white just at the bifurcation with extension into the right main bronchus.

With a small suction tube the plaque of membrane was removed from the trachea. After the removal of this parietal plaque from the trachea and bronchus further membrane was not seen. The area was swabbed with antitoxin and as the respiratory difficulty was relieved we did not introduce the long one-year tube as is usually the custom after the removal of membrane. However, reintubation was necessary before I left the hospital, a one-year short tube being inserted which separated the subglottic edema and gave prompt relief. There was a sharp reaction following the bronchoscopic manipulation and the temperature rose to 103.8° Fahrenheit. The following day Dr. Eberle thought he could elicit a definite area of pneumonia over the right upper lobe anteriorly which was probably a diphtheritic pneumonia. The pneumonia, however, gradually improved and April 6, the temperature was 100°. From this time on the general condition of the child improved and he made a perfect recovery. The tube was removed and reintroduced six times before the patient finally remained without the tube. The little patient was discharged as cured May 13, 1916.

Case 9. Gussie W., age 7 years, ill three days, was admitted to the Kingston Avenue Hospital April, 1916, for laryngeal diphtheria. An attempt to relieve the dyspnea by intubation was performed by the ambulance surgeon at home, but as the tube made the dyspnea much worse he removed the tube and rushed the child to the hospital. On admission Dr. Hook of the Resident Staff intubated the child but there was no relief and the tube

became obstructed with membrane. Further attempts were made to relieve the dyspnea with longer tubes but without success. Dr. Adam Eberle was called and owing to the extreme condition he did not attempt further intubation but promptly performed tracheotomy. On opening the trachea Dr. Eberle removed a cast of membrane and the condition of the child improved. The temperature after the manipulation was taken and found to be 105.2° , respiration 54, pulse 150. Heavy doses of camphor in oil hypodermatically were given, and later, after the child reacted, 25,000 units of antitoxin were injected intramuscularly. The child had a fairly comfortable night but became very restless and dyspneic the following morning and Dr. Eberle notified me of the condition. A physical examination before attempting bronchoscopy was of little aid as the constant coughing and rattling of mucus in the tracheal canula rather distorted and magnified sounds elicited by auscultation. However, there was increased percussion resonance over the right upper lobe, the lung which proved later by bronchoscopic examination to be obstructed by foreign body membrane. There was no involvement of the tonsils or pharynx, which were viewed on introduction of the speculum, though there was a slight nasal discharge. As the larynx came into view the tracheal canula was removed. A rapid view of the larynx showed it to be free from membrane but congested from the many intubations. The 5 mm. Jackson bronchoscope was introduced. As Dr. Eberle had removed a cast the night before no membrane was encountered until the carina trachialis was reached when a loosely attached proximal end became visible. This piece of membrane was easily removed by suction on account of its loose attachment and when removed through the tube measured a little over $2\frac{1}{2}$ cm. in length. The cast was a cylinder with a torn and fringed distal end. On further examination of the bronchus it was noted that the mouth of the right superior lobe bronchus was still occluded. This membrane was rather firmly attached and suction only removed very small pieces of it, but with the curved forceps of Dr. Jackson the membrane was grasped and a torn piece $1\frac{1}{2}$ cm. in length was removed. As the child did not stand the manipulation well the bronchial area was rapidly swabbed with antitoxin by means of a Jackson sponge and a long bronchial intubation tube introduced. The tracheal wound was lightly packed with plain gauze and a wet dressing applied. The child was very restless during the night and was given small doses of morphia 1-32 of a grain every six hours. The next day, April 17, the child

was slightly improved and the temperature had fallen to 103°, though cyanosis was marked. On April 18, the bronchial tube was removed. No attempt had been made to close the tracheal fistula which was left open as a safety valve though it had been loosely packed with a gauze plug and a small adhesive plaster dressing on the neck. There was a profuse discharge from the tracheal wound the following day and the dressings had to be frequently changed. Dyspnea and cyanosis were marked at times and there was almost complete consolidation of the upper lobe of the right lung—a diphtheritic pneumonia. Suction was applied from time to time through the open tracheal fistula and as the child seemed to breathe better without the tracheal canula and owing to the profuse tracheal discharge which constantly plugged the canula it was dispensed with. On April 24, owing to the dried muco-pus causing extreme dyspnea and cyanosis, Dr. Joyce reinserted the tracheal canula and by suction removed much of the obstructing secretion. Later he removed the canula only after it became obstructed and inserted a long intubation tube. Much secretion was coughed through the intubation tube and dyspnea again relieved for the present. Within two hours the intubation tube was removed as it became obstructed and the long cane-shaped tracheal canula of Dr. Jackson once more introduced. The unfortunate little patient lingered in this terrible state with constant obstruction to respiration and frequent changing of tracheal canula and finally succumbed on April 28, 1916.

This case demonstrates the unfortunate outcome when the diphtheritic membrane is not entirely removed at the first attempt. No doubt the finer bronchi were involved which accounted for the extensive pneumonia which is in fact pathologically a necrosis of the lung. Such cases are not at all unlike foreign body types other than diphtheria membrane, such as peanut and carrot pulp. These substances as you all know are extremely irritating when in the lung and if not removed at the first attempt the case frequently terminates fatally from diffuse bronchopneumonia or abscess of the lung.

Case 10. L. W., age 5 years, ill four days, was admitted to the Kingston Avenue Hospital April 15, 1916, suffering from laryngeal diphtheria and was intubated by Dr. Frick of the intern staff twenty minutes after admission. As the tube gave immediate relief no one suspected that there was membrane below the tube which was to give trouble later. A dose of 20,000 units of antitoxin was administered. The pharynx was congested but no membrane was

seen. There was no nasal discharge. A rather superficial physical examination of the chest was made which showed scattered subcrepitant rales over both lungs. Scattered tubal transmitted subcrepitant rales are not at all uncommon in all intubated cases; no note was made, however, of diminished respiratory murmur.

The following morning at 8:15 o'clock, just twelve hours after admission, the tube became blocked and was immediately extubated and promptly reintubated. There was some difficulty in reintroduction of a 4-5 O'Dwyer tube with which the boy was originally intubated and a tube of one-year size was introduced which gave no relief. Dr. Eberle was called and promptly removed the small tube and reintubated with a 4-5 tube without difficulty. Dr. Eberle notified me of the presence of membrane below the tube and the same afternoon we bronchoscoped the patient. No membrane had been expelled after the frequent extubations and reintubation was immediately necessary. A physical examination by comparison of both lungs showed by auscultation that little air was entering the right lung. The percussion note was higher in pitch over the right upper lobe in comparison to the note over the other portion of the lung, both anteriorly and posteriorly. By direct inspection the intubation tube was removed. The larynx was free from membrane but was very edematous and there had apparently been much trauma in the region of the right ventricular pouch, which probably accounted for the difficult reintubation after the tube had become blocked about twelve hours after admission. The 5 mm. bronchoscope was introduced and membrane was readily seen about 2 cm. below the cricoid level. The membrane was removed by suction, the cylinder cast being 3 cm. in length. The right bronchus was examined and there was considerable edema and some small ulcerations where the cast had been attached. The membrane had also involved the mouth of the right superior lobe bronchus and a few small shreds of membrane were removed from this region. The left bronchus was not involved. The usual application of antitoxin swabbing was made to the involved area, and a long tracheo-bronchial tube introduced. The boy became very restless and delirious following the removal of the membrane which had taken just seven minutes, and the temperature rose rapidly to 105°: the pulse was imperceptible, and with extreme cyanosis and rapid respirations the outlook was very discouraging. The temperature continued to rise, which is often the case just before demise, and reached 105.6° at midnight. However, there was a sudden change for the temperature began to fall during the

early morning hours together with the respirations. The pulse was still weak and rapid. The next day, April 17, at 4 p. m. the long tube was removed. A curdy mass was coughed out following its removal. Three hours later dyspnea became urgent and Dr. Eberle intubated with a 4-5 O'Dwyer tube. This tube was auto-extubated fifteen minutes later and the patient was reintubated by Dr. Frick with a 6-7 tube. The tube was again coughed-up one hour later and the same size tube was reintroduced by Dr. Frick. On the afternoon of the 18, as the temperature was falling, the tube was removed by direct inspection to ascertain the cause for reintubation. There was supraglottic as well as subglottic edema, and the arytenoid cartilages were about three times their normal size. Because of these findings we decided not to interfere with the tube for at least one week and give the larynx a rest. This seemed impossible as the tube was repeatedly coughed up and ceased only after a 4-5 non-cough-up tube of the writer's model was introduced. The non-cough-up tube was not disturbed for five days and was then removed only after inspection of the arytenoid cartilages to see if the infiltration had subsided. On removal of the tube ventricular band and vocal cord spasm necessitated immediate reintroduction of the tube. The boy was at this time in fairly good condition and had recovered from the tracheo-bronchial diphtheritic attack but was unable to remain without the intubation tube. When the regular tube of Dr. O'Dwyer was introduced it was promptly coughed up, and the only tube that would remain in situ was the bulbous tracheal non-cough-up tube. On April 28, after having coughed up the regular O'Dwyer tube four times, a small swelling was noticed in the cricothyroid region of the neck and recognized as a beginning peri-laryngeal abscess complicating perichondritis at the cricoid level. The neck was poulticed and when the abscess came to the surface it was incised and drained. The following day tracheoscopy was performed and ulcerations were seen at the cricoid level. No pus was draining into the larynx from the abscess cavity. On May 6, extubation was performed by Dr. Cannon, the Resident Physician, but immediate reintubation was necessary, the 4-5 non-cough-up tube being used.

It is an interesting fact that all of the cases of chronic laryngeal stenosis following diphtheria have similar histories of frequent auto-extubation during the first two or three weeks of the disease. On the other hand, however, we frequently meet with cases who wear the tube from four weeks to four months and subsequently are detubed permanently even when special laryngeal

measures are not resorted to as an aid to detubation. During one year we had sixty-eight cases of the sub-acute type, as I classify them, and all of them made recoveries. Not one of this group became chronic. This, therefore, is the reason why we wait to see whether the case is to be chronic rather than perform tracheotomy, etc., when such procedure is not absolutely indicated as many of the cases of this type recover, as I have already stated, without any special surgical measures. This case unfortunately became one of the chronics, and at the time this paper was read had worn tubes of special size and shape off and on for a period of one year. Repeated laryngeal galvano-cautery knifing and puncture have been made to the subglottic region and reintubation with soft rubber covered intubation tubes after cauterization. The boy has a remarkably good voice even after tubage of such duration and at the present time, April 15, 1917, seems to be apparently cured as he breathes well and has remained without the tube for a period of two months. We do not consider, however, any case as cured until the child has been detubated and is breathing well for at least a period of two years. Of course we are all hopeful that a cure has been effected but until the lapse of two years we shall not consider him cured. While the latter part of this history has no direct bearing on the title of the paper it is extremely important to report what does happen in some of these severe cases that recover and also to impress the fact that it is the inevitable nature of the pathological process at the outset of the disease which later is followed by the production of chronic cicatricial tissue.

Case II. V. M., age 2 years, was admitted to the Willard Parker Hospital with a history of having aspirated a piece of egg shell three days prior to admission. The family physician who was called to see the child thought he was suffering from laryngeal diphtheria and notified the Health Department. As the child was dyspneic and required surgical care the parents were persuaded to send the child to the hospital. On admission to the hospital the family physician informed Dr. Grover of the history of the foreign body egg shell and further stated that the case was not one of diphtheria and he had changed his opinion after he had examined the larynx with a speculum and seen the foreign body. With this history at hand Dr. Grover examined the larynx with the infant speculum of Dr. Jackson and saw a small white substance at the level of the cricoid which he thought may be either egg shell or diphtheria membrane. As he did not wish to pass a bronchoscopic tube before I had seen the case, and as he knew that I

was expected at the hospital he very kindly left the task to me to decide the nature of the intruder. Through the direct speculum the same object was seen as noted by the family physician and Dr. Grover and both were eager for an opinion. The picture presented was not unlike many others and was thought to be diphtheritic membrane. The 4 mm. bronchoscope was carefully introduced and as it encountered the object it was very evident that it was not egg shell but diphtheria with which we had to deal. The small tracheal plaque was removed by suction and swabbing, a dose of 10,000 units of antitoxin administered and the child placed in the laryngeal ward. Intubation was not necessary, and the child made an uneventful recovery. Pharyngeal cultures were negative, but cultures made from the membrane showed Klebs-Loeffler bacilli.

A review of the cases demonstrates the fact which Dr. Chevalier Jackson has so often called attention to, that bronchoscopy and esophagoscopy can be performed without anesthesia, local or general, on adults as well as on children. Again, a patient without general anesthesia is much more of help than a hindrance to the operator and the operator loses no unnecessary time for there is no tendency to prolong the operation as it may be under general anesthesia. Of course no case of diphtheria should ever be anesthetized for the removal of membrane. The profound carbonic acid poisoning from which all of these patients suffer makes a very good anesthetic for those who wish to satisfy their minds that general anesthesia is necessary. With the relief of this condition the child quickly returns to a normal state. Case 1 demonstrates the fact that an adult of 230 pounds can be easily bronchoscoped and the tube remain in situ for thirty minutes with practically no discomfort to the patient. In this case as in many of the others small doses of morphia and atropia were used. These drugs, more especially morphia, is the very best heart stimulant we have for this disease. Secondly, the atropia removes the greater part of the secretion which without it is often profuse. No doubt the accident in loosening the swab on removing the carrier has occurred many times before, but it does not happen since the long screw shoulder was added by Dr. Jackson. Case 2 demonstrates very forcibly the valve-like action of the loose membrane in causing over-distention of the lung with subsequent rupture of the alveoli and general subcutaneous emphysema, even when no instrumentation whatsoever has been attempted. It will also be noted that some of the moribund cases drowned in their own secretions. This was unfortunate even with continued suction. The profound carbonic acid poisoning and diphtheritic toxæmia

were also responsible. In two of the cases there was some difficulty in removing the membrane as the distal end was detached and flapping into the mouth of the tube while the proximal end of the cast was held tightly by the tube to the tracheal wall. This was in reality an overriding of the foreign body by the tube, which has so often been called to our attention that this error in technic should have been avoided.

The child with membrane causing obstruction below the distal end of the intubation tube will often when extubated breathe far better than when the tube is in situ. They will also regulate the amount of air taken with each respiration and breathe as quietly as possible. This is quite a common occurrence and we have often recorded this shallow respiration as an endeavor on the part of the child to prevent coughing. On the other hand, when the membrane obstructs respiration there are violent spells of coughing accompanied by urgent dyspnea.

Case 7 demonstrated that direct extubation may cause supraglottic and arytenoid edema even when performed rapidly. This case was unable to remain without the tube when it was removed through the speculum, and even when no infiltration was seen at the time of removal. At the suggestion of Dr. Thos. Joyce the tube was removed by the digital method. The patient remained permanently detubated after removal and had not even the slightest dyspnea or stenotic cough.

It is obvious that it is necessary to remove all of the obstructing foreign body membrane at the first attempt, but often this is impossible and the unfortunate child dies later of necrotic diphtheritic pneumonia.

In the tracheotomised cases in this series the same result followed as in all of my cases tracheotomized for the relief of tracheo-bronchial diphtheria; that is, they all terminated fatally. Of course all of these cases were moribund with the exception of case 9, who lived for thirteen days. All of the membrane was not removed from this child at the first attempt and the fatal result was due to necrotic pneumonia.

We have had a number of cases with foreign bodies admitted for diphtheria and treated for this disease in the hospital and the cause was discovered only after Dr. Gover or myself had made a direct examination of the larynx and trachea. The exception to the rule is case 11, who was admitted with a definite history of a foreign body and by direct inspection was definitely proven to be suffering from tracheal diphtheria.

127 West Fifty-eighth Street.

EPITHELIOMA OF THE MIDDLE EAR AND MASTOID; REPORT OF A CASE.*

DR. F. A. BURTON, San Diego, Cal.

The purpose of this paper is to present for your consideration and discussion malignancy of the middle ear and mastoid, giving in this connection, however, the experience of others to a greater extent than that of my own, which is limited to one case.

The only thing I can add to the literature on this subject is the report of an unusual case of epithelioma, probably beginning in the middle ear, extending to the mastoid and later into the cerebellum.

In the investigation of cancer during the last two decades very extensive experimentation has been made. The net results, however, appear to be that of proving the insufficiency of all theories that have been advanced up to the present time. Of the nature of cancer probably it might be said that there is scarcely a working explanation.

Through recent experimental investigation much light has been thrown upon factors which predispose to cancer, but the certain cause of cancer is yet to be discovered. Chronic irritation has been found to be a frequent predisposing factor. It is important that we realize that cancer may grow in either one of three ways: With cells in solid cords and masses (the most characteristic and usual way), or as an adenoma or as a papilloma.

Malignancy of the middle ear and mastoid is extremely rare, there being reported in the literature, as far as I know, less than fifty cases. Epithelioma is more common in older, and sarcoma in younger individuals. Story reports that during seventeen years on the staff of the largest aural hospital in Ireland, where 1,000 new ear cases are seen annually, no case of malignancy of the ear had been observed. Malignancy may follow long continued ear suppuration. Schwartze, however, is quoted as saying that it usually attacks a perfectly healthy ear. Politzer tells us that the most frequent point of origin of epithelioma of the ear is the auricle and the external meatus. Bezold, in observing 20,000 ear cases, found carcinoma but four times. In recent years, however, a greater proportion of such cases has been reported, due, no doubt, to the increasing use of the microscope. Satisfactory explanation for the infrequency remains to be determined, but among the probable reasons are the marked degree of natural protection afforded the middle

*Read before the California State Medical Society at Coronado, Calif., April 17, 1917.

ear and mastoid; the fact that this area is practically free from glands, and that nevi, moles, warts, and allied conditions to which fatal cases of malignancy are often traceable, do not develop within the middle ear or mastoid cells. And when one considers the fact that the lining membrane of the middle ear and mastoid is made up of only one or two layers of pavement, polyhedric or ciliated epithelium, it does not seem far fetched to believe that the comparative lack of cell mass, is also a factor. Cancer may attack the auditory apparatus by extension from neighboring organs, for example, the parotid glands or the dura.

Kuhn believes that the diagnosis of epithelioma should be made only after careful consideration of the clinical course as well as the findings of the microscope. To support him in this belief, Kuhn calls attention to a case of ulcer of the external auditory canal associated with enlargement of cervical glands in which there was a diagnosis microscopically of cancer, but through being rapidly cured under mercurial treatment proved to be syphilitic. Benign growths of the ear may and do from time to time, become malignant but malignancy is not shown in a large percentage of the cases until after opening the mastoid. In sixteen cases reported by Kretschman, malignancy was not recognized in five until after operation, and out of six cases at Schwartz's clinic but three were recognized as such before operation. Bilroth has called attention to the slowness of growth in old persons and believes that rate of development decreases as the patient grows older. Of the cases reported, scarlet fever was a very frequent cause of the previous otorrhea. As a result of actual clinical experience acquired through the study of hundreds of cases occurring in different parts of the body, there is strong evidence of proof that a large percentage of severe and sometimes fatal neoplasms are traceable to what seemed to be insignificant, harmless growths, which were subjected to chronic irritation. So it is the duty of every physician and surgeon to carefully observe and advise all patients with conditions which are known to predispose to the development of cancer.

The case which I wish to report was that of a widow, aged 43, who first applied to the San Diego County Ear, Nose and Throat Clinic, November 18, 1914, for relief from pain and aural discharge of very offensive odor. There had been discharge from the right ear for about five years (cause unknown); impaired hearing for six weeks. There was pain, tinnitus but no vertigo. There was no spontaneous nystagmus; the turning and caloric

tests were not made; Weber test lateralized toward the involved ear. Family history negative. For three or four years the patient had had pain in the ear; for six or seven months the pain had been very severe and the discharge had increased in amount and offensiveness. For about this same period she had noticed slight impairment in movement of the jaw and face muscles, some difficulty in closing her right eye, as well as a slight progressive loss of weight. The patient had had a growth removed from her shoulder 12 years previously, nature of growth unknown. No recurrence. Polypoid appearing growths filled the external auditory meatus and upon swabbing, bled excessively. There was very offensive profuse otorrhea; only slight pain from pressure over mastoid. *Diagnosis:* Chronic purulent otitis media with



Fig. 1. Epitheliomatous mass (actual size) removed. Post-mortem.

polypi. The polypi were removed with the cold wire snare. The bleeding was excessive and it was impossible to determine that all the polypi had been removed. The bleeding was controlled by gauze packing. Post-operative treatment consisted in cleansing with soda water, application of silver stick and the instillation of hot ichthol and glycerine. After the removal of the "polypi" the patient expressed herself as being somewhat relieved of pain and discomfort and said there was improvement in hearing. However, in a few days following the operation the ear refilled with polypoid appearing growths. On account of the profuse bleeding and the pain encountered on treating the ear, investigation was not satisfactory until the patient was etherized, when the probe revealed loss of posterior wall of bony canal. The free bleeding, rapid recurrence and loss of posterior wall of bony canal, made me think of malignancy. A section was removed and sent to the pathologist, who reported epithelioma.

With a diagnosis of epithelioma, the case was placed under treatment by a local roentgenologist, who believed that through the use of the x-ray he could be of undoubted service. For several hours following an X-ray exposure there was relief from pain, but the pain always reappeared and with increasing intensity. After two months of bi-weekly applications of the Roentgen rays the patient reapplied to me for relief from excruciating pain. She said she had not been able to sleep for several days and nights.

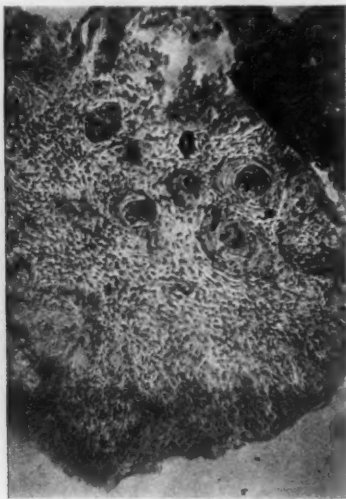


Fig. 2. Section shows a very cellular stroma enclosing several epithelial cell-masses and "pearls." There is a polygonal epithelium of variable depth on the surface, and one papilla is shown which has proliferated deep down into the mass and undergone central hyaline degeneration ("pearl").

The area over the mastoid was edematous and perforated, with some pus discharging through the fistulous openings. The patient was sent to the hospital, where the usual curved incision for mastoid operation was made, the ear carried well forward over the cheek. On removing a thin shell of honeycombed bone, a large granulation mass was exposed, but the disease showed no tendency to spread to the auricle. The wound was left open that the growth might be unconfined. The amount of cancer fluid was excessive, the odor extremely offensive. Dressings were changed daily and cleansing treatment instituted, but no treatment seemed to be of any service other than that of palliation. The free mastoid opening, however, gave great relief. It relieved the confinement of the growth as well as that of pus and cancer fluid. In the

course of the disease there were three abscesses in the neck, two of which were opened externally, and one through the mouth. There was complete right facial paralysis, paralysis of right vocal band, great difficulty in swallowing. There was at no time protrusion of the growth from the meatus, as is reported in so many cases. Hearing was not lost. The lymphatic glands in the neck at no time became much enlarged or especially sensitive. Land marks of the temporal bone as well as the most of its structure had disappeared.

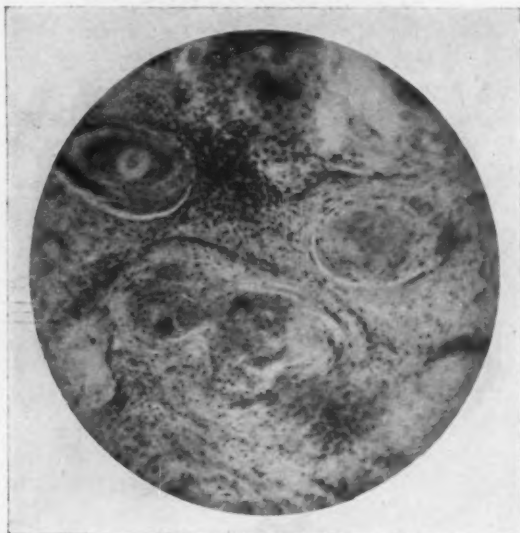


Fig. 3. A higher magnification of an area showing epithelial "pearls," one containing a giant cell, and an area of round-cell infiltration of the stroma.

In most of the reported cases there was greater impairment in hearing than in this case. Almost without exception the patient grew rapidly worse after surgical interference. My case was no exception in this particular. In this case there was an unusually great amount of bone necrosis. In most of the cases the meninges remained intact but in mine there was extensive loss of these membranes. I had expected for some time that my patient would die of meningitis, but death occurring eight months after the first visit, was due to toxemia and exhaustion. During the greater part of the time that she was under observation, her temperature was normal, sub-normal or slightly elevated, seldom exceeding one degree above or below

normal. The pulse rate was proportionately higher. Emaciation became very pronounced.

With the understanding on the part of the members of the family that no investigation would be made except behind the ear, and that the head would be left looking no worse than before autopsy, the following points were acquired: Most of the temporal bone was gone; there were no meninges covering the adjacent cerebellum; a large amount of cerebellum was macerated, the tumor was not encapsulated, and there was semi-liquid extension upward to the tentorium cerebelli and downward into sheaths of cervical muscles and vessels, as well as deep into the substance

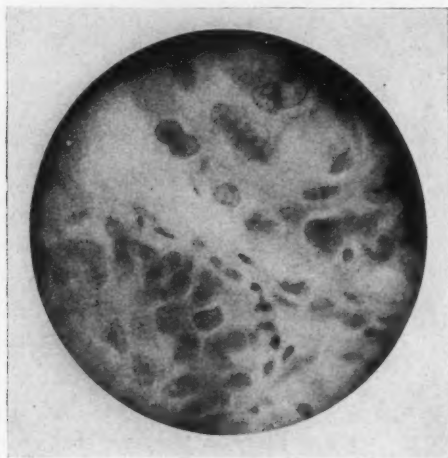


Fig. 4. A high magnification of epitheliomatous cell masses, showing cell division.

of the cerebellum toward the foramen magnum, with abundant pus burrowing in every direction. It would have been of value to have noted the condition of the blood vessels—the sigmoid sinus and termination of the carotid—but this was not done. There was communication with the naso-pharynx by way of a patulous Eustachian tube. Permission not having been obtained, metastatic abscesses were not looked for.

The epitheliomatous mass was dissected out and a section sent to the laboratory for re-examination. The pathological report by Dr. H. A. Thompson corresponded microscopically with that which he previously made, and was as follows: "Tumor was 2.5 cm. by 2.0 cm. by 2 cm., markedly papillomatous. Had the appearance

of a typical epithelioma. Microscopical examination showed it to be made up of papillomatous masses of squamous epithelium. Cells did not show evidence of a very rapid growth, their staining being moderate and comparatively few mitotic figures being present, and some areas showed many concentric masses of epithelial cells—the epithelial pearls. The connective tissue showed marked round-cell infiltration."

In all suspected cases of cancer the patient should be given the benefit of the doubt until a reliable diagnosis can be made, and since there is not as yet a reliable sero-diagnostic test for cancer, a positive diagnosis of malignancy should not be made without a careful consideration of the clinical picture and the use of the microscope. There are many instances recorded where malignancy had not been discovered microscopically until after repeated sections had been examined.

One can but regret the fact that the public is constantly encouraged to listen to old discarded views which even to-day are continuously put forward and sometimes labeled as new, presuming to cure cancer without the use of the knife. Such representations, or shall I say misrepresentations, are likely to catch the ear of the ignorant and the timid who have acquired a fear of surgery. It is said that about eight or nine per cent of the patients operated upon for cancer, or sent to the mortuary as having died of cancer, were not sufferers from the disease.

In the early stages malignant growths of the middle ear usually look like polypi but are more ashy in color. There is often spontaneous hemorrhage, excessive and more or less persistent bleeding at time of removal, as well as quick return after removal. On touch there is more bleeding than in the case of simple granulation polypi.

In the prognosis of cancer of the ear early recognition and early radical operation are extremely important factors. In one of Kuhn's cases after the removal of the membranous ear canal and auricle for cancer of the ear, there had been no return for six years. After malignant involvement of the mastoid cells it is probable that operative interference is contraindicated and should not be done unless for the relief of pressure symptoms.

The treatment of cancer has been assisted materially through the knowledge which has been acquired of its histo-pathology. The result has been to establish the view that in its incipency cancer is a local condition, and that complete removal of the primary focus removes the malignant process and cures the patient. From a therapeutic viewpoint sedative and not irritative treatment should

be the watchword. This is true not only where there is positive diagnosis of cancer but also where malignancy is likely to develop. There appears to be practically no place in the treatment of malignancy by means of caustics where there is hope of cure. Surely in no cases except those known to be superficial, slightly circumscribed and of slow growth. It is true, however, that even the most expert diagnostician may be unable at times, to make this differentiation. It should also be remembered that the growth may be small, apparently slight or circumscribed and yet for the reason that it has marked tendency for the formation of metastasis, be very virulent. It must be obvious that in such a case the use of a caustic which failed to destroy every vestige of malignancy before metastasis had occurred, would only augment the danger. One should also remember that an unsuccessful surgical attempt at removal, would in all probability be followed by increased rapidity of growth.

Of the sixteen cases cited from the literature by Kretschman, eleven were preceded by otorrhea of long standing. The point of origin, however, is not always capable of being determined because of spread of the growth when cases are first seen. If the tumor is of a glandular type one can say with comparative certainty, that it originated from the ear canal, as the existence of glands in the mucous membrane of the tympanic cavity has not yet been proven. In determining the nature of tumors the clinical course should be considered, as the microscopical examination is not reliable enough to depend entirely upon it. Marked head congestion during the progress of cancer of the middle ear or mastoid suggests a rapid vascular obstruction and should be looked for.

Carcinoma may spring from the external ear, the middle ear or the mastoid cells but from cases on record it would seem that irritation, due to the presence of pus, plays an important role, as the vast majority give a history of long-standing otorrhea. By long continued irritation from pus, or chronic eczema, there is a favorable nidus for the development of malignancy. The literature shows that cancer often reaches the dura but seldom perforates it. And but few cases of metastatic tumors with the ear as a primary focus have been reported.

One should make a microscopical examination of pathological structures in all cases of chronic otorrhea occurring after middle life which show a tendency to recur, and the question of the origin of a malignant growth should be promptly determined on account of the possibility of extirpation in cases diagnosed early.

404 Watts Building.

VINCENT'S ANGINA.*

DR. FRANK CARROLL, Cedar Rapids, Iowa.

Vincent's Angina, is the local manifestation in the throat and mouth of a disease caused by the fusiform bacillus and spirillum bearing Vincent's name. Various other names have been given to this infection, such as ulcerated stomatitis, ulcerous angina, diphtheroid angina, etc. The discovery of the fusiform bacillus is not a new thing as F. Y. Clark described such a bacillus as far back as 1879, while Miller described the bacillus and spirochete in his work on "Bacteria of the Mouth," written in 1883. In the *Lancet* of April 14, 1888, Lingard and Batt described an affection of the tongue and mucous membrane in calves which strongly resembled Vincent's angina, while in the same journal and in July of the same year, Lingard found a bacillus forming long threads in calves, monkeys, horses and in man. The credit of reporting the first cases of Vincent's angina in man probably belong to Rauchfuss, who, in 1893, reported a number of cases in the children's hospital in Petrograd. He described the bacteriology and published photographs of the bacilli and spirilli, now identified as Vincent's angina. Others described the same thing at about the same time, but it was not until 1896 that Vincent published a full description of the fusiform bacilli and the spirilli in hospital gangrene and called attention to the presence of these organisms in certain ulcerative anginas. Although more or less was known in Europe of Vincent's fusiform bacillus and spirillum from the time of Rauchfuss' first report in 1893 up to 1905, a period of twelve years, yet at this time, Vincent, writing in the *Lancet*, mentions but two articles by Americans, and over eighty by Europeans. In the *Journal American Med. Assn.* of July 23, 1904, Crandell reported what he assumed to be the third case in the United States. More recently numerous articles have been published in this country, notably by J. J. Richardson, W. Wingrave, Gerhard H. Cocks, J. Z. Bergerron, and others, so that knowledge of this disease is becoming more general.

Etiology. Although this disease is found among all classes, yet its most frequent occurrence is among those who either live or work among unsanitary conditions. The disease is more common among

*Read before the Sioux Valley Eye and Ear Academy, Jan. 23, 1917.

ill-nourished people and frequently follows diphtheria, scarlet fever, etc. Any ulceration, especially if deep or of a gangrenous nature of the tonsils or mouth in the late stages of diphtheria or scarlet fever, should be looked upon with suspicion and examination should be made for the fusiform bacillus and spirillum. Many times these deep ulcerations are caused by the streptococcus, but when deep and necrosing, are liable to be caused by the fusiform bacillus and spirillum. Many things may predispose to Vincent's angina, such as dental caries, or any septic condition of the teeth or alveolar process, lymphoid tendencies, degenerated tonsils, trauma, and some say mercurial stomatitis. Excessive use of tobacco is said to aid in the development of the disease, and naturally, any uncleanness of the mouth will hasten its development. The disease need not necessarily begin in the throat, but may appear as a small ulceration on the gums or inner side of the teeth. There is nearly always the formation of a membranous exudate on the part involved. There is usually an extension to the neighboring gland and the constitutional symptoms are often grave. A great many times cases are diagnosed clinically as diphtheria when a laboratory test would prove the Klebs-Loeffler bacillus entirely absent. The disease has been considered rather rare, but authorities now concede that it occurs more often than was supposed and a great many times more frequently than is recognized. The disease occurs more often in males than in females and usually before middle age is reached.

Many cases go unrecognized even in large hospitals, where the means are at hand for proper laboratory tests. This is owing to the fact that often times, only cultures are made. As compared to the number of cases of membranous or ulcerative throat cases, in a large hospital, but a small percentage prove to be Vincent's angina. Some hospitals give as low as one-half of one per cent, while others as high as 33 per cent. This great variation suggests that there must be something faulty with the diagnosis, or that in a given period the disease is much more prevalent. Major Chamberlain states that very nearly 50 per cent of the mouth and throat ulcers, occurring in the Philippine Islands, show the fusiform bacilli and spirochete in great or less number. Koplik also reports large numbers found among the patients of the Mt. Sinai Hospital in New York, who were suffering from gangrenous affections of the mouth.

Contagion. This disease has been reported as transmissible and a number of good authorities have reported contagion, but such

contagion is due to close contact, as the common use of eating or drinking vessels, or carelessness by an attendant in the use of surgical instruments. Todd of Minneapolis, reports the case of a pathologist who contracted the disease during an epidemic in an insane asylum. One epidemic is reported in which the contagion was due to the common use of a tobacco bag, each smoker drawing the string together with his teeth. Green, in the *New York Med. Jour.* of September 6, 1913, reports a number of cases of contagion, all due to a matron in a nursery, feeding children with the same spoon. Cases of infection by the patient of other parts of his own body, are also reported. One of a man, who infected a hand by biting his nails. Dr. S. McCall Hamill issues a warning in the use of anti-toxin in diphtheria and states, that at times the organisms of Vincent's angina exist in the mouth and become virulent during the lowered resistance following the use of anti-toxin. He, however, recognizes the contagious character of Vincent's angina and mentions the case of a physician who had a severe attack after an infected child had coughed in his face. Many physicians think that this disease should be made reportable.

Pathology. Vincent describes two forms of this disease. The first characterized by the pseudo-membrane, which resembles diphtheria very much. It begins with a slight pharyngeal pain and a small whitish spot, at first scant, then thicker, and this enlarges and rests on the red and inflamed mucosa. This membrane is easily removed and it is seen that it rests upon an ulcerated and bleeding surface. The sub-maxillary glands are usually swollen. There is slight fever. This variety shows the fusiform bacillus alone, but it may be associated with streptococci or staphylococci. This form is the rarer of the two. The second form is ulceromembranous, and is more common and more important. It is more intense and more destructive of tissue than the first. In this form both the fusiform bacillus and the spirillum are present. The tonsil is the usual point of attack. Both tonsils may be involved and practically all of the mucous surface of the buccal cavity. There is usually a foul odor and sometimes a bloody discharge. Three stages are given to the progress of the disease; first, congestion; second, formation of membrane which occurs in from one day to a week after the onset, and third, ulceration followed by repair when the prognosis is good and when not good, by gangrenous processes and rapid destruction of tissue. The extension of the ulcer is usually lateral. Recovery is usually within a few days, but more persistent cases last for weeks or even months.

There is great variation in the temperature of these cases. In some instances the rise is scarcely above normal, while in others it goes as high as 103°. The constitutional disturbance also varies greatly. In some it is so slight as to be scarcely noted, while in others there is great depression, fever, furred tongue and loss of appetite. The onset is sudden, beginning, as a rule, with pharyngitis, tonsillitis or acute stomatitis, followed by the formation of the membrane. Chills and fever are often present. There is generally pain at the seat of the lesion, pain and difficulty in swallowing, some enlargement and tenderness of the submaxillary and cervical lymph glands and often times pain extending down the neck into the chest. The symptoms ordinarily are much like those of follicular tonsillitis, but there is less temperature, greater malaise and more local pain. In the total lack of temperature in many cases Vincent's angina differs from every other tonsillar affection. However, when Vincent's angina occurs as a secondary infection, the symptoms are more pronounced and may even progress to death in a brief period from toxemia or exhaustion. In these severe cases, necrosis is very rapid, the tissues fairly melting away and destroying large areas in an incredibly short time. The ulcers vary in size and depth and in the deeper ulcers, may even resemble the edges of syphilitic ulcers. They have a base resembling a worm-eaten surface. Before the development of ulceration, the membrane is soft and thin and adheres loosely, but as ulceration develops, the membrane takes firmer hold, but still remains soft. When this membrane is removed, it immediately reforms. The breath is fetid and some observers term the odor characteristic. Recurrence of the disease is said to be not uncommon. Halsted states that a scar or cicatrix in the soft palate or throat is no more presumptive evidence of previous syphilitic disease than it is of previous Vincent's angina.

Diagnosis. Vincent's angina may be confused with an ulceration of the gums, a mucous patch, follicular tonsillitis, syphilis, diphtheria, carcinoma, and other affections and it may be associated with other organisms. Of course, the rule is that the organism found in greatest numbers, must be held responsible for causation, yet caution must be used as sometimes the organism present in the lesser number may be proven to be the true positive factor. The question of numbers is largely determined by the character of the media which develops more of the organisms to which it is best adapted. In diphtheria the membrane is thick and tough and in Vincent's angina light and friable. These signs and the smear should render diagnosis accurate; membranous croup and laryn-

gitis must be excluded. Vincent himself states that this disease is easily confounded with syphilis and that secondary and tertiary syphilis may become secondarily infected by the fusiform bacilli and spirilli. These organisms seem to have a peculiar affinity for syphilitic ulcers about the throat. Frequent absence of some of the symptoms and a great variation of all of the symptoms, makes the diagnosis somewhat difficult. The greatest reliance must be placed in the smear. Complications with Vincent's angina are many and varied and this again interferes with the easy diagnosis of the disease.

Treatment. If the disease attacks the tonsils, all crypts should be thoroughly opened to promote drainage. The membrane should be removed and affected surfaces cleansed with dry clean cotton and then some application made to this dry clean surface. One of the best applications is monochloracetic acid. Many men use the trichloroacetic acid but the difficulty with this is the fact that it is not a self-limiting acid and may produce too extensive a cauterization. Iodine or chloride of iron in glycerine is also used for local application. Nitrate of silver is sometimes used. Some men use peroxide of hydrogen followed by chromic acid. In this latter we again have the danger associated with using an acid which is not self-limiting. Excision of the necrotic parts or the use of the actual cautery is strongly condemned by most writers, as it should be. Mercury should not be used, even should syphilis be associated with Vincent's angina, until after the angina is checked, as mercury has the effect of increasing and prolonging the angina. Attention should also be given to the hygiene of the mouth. The French report wonderful results from the use of salvarsan. In the *Annals of Otology*, of March, 1915, H. H. Stark reports 25 cases successfully treated with sodium perborate; two teaspoonfuls dissolved in a glass of water and used as a gargle frequently. The pain and discomfort respond quickly, he claims. From the fact that careful examination of throat smears frequently reveal the organism of Vincent's angina, the question arises is Vincent's angina a clinical entity or is it a secondary infection?

Case 1. Stage manager in opera house, 28 years old, came to me and stated he had a sore throat for 5 weeks. Family physician had treated him, but with no benefit. Pharynx and uvula much swollen and very red. Some small white patches on tonsils which came off easily but reformed in a very short time. Painted with pure oil of cassia, swelling subsided but patches on tonsils persisted and became larger. As I was uncertain as to the correct diagnosis,

I sent the patient to our laboratory for careful laboratory examination. Report came back that the case was undoubtedly one of Vincent's angina, as both the fusiform bacillus and spirillum were present in large numbers. Monochloracetic acid applied and the membrane disappeared after a very few treatments, but redness and swelling of the tonsils persisted and the patient seemed very sick. There was little or no temperature. The membrane returned and I watched it for two days; it spread over both tonsils and over the soft palate until it met. Again I used monochloracetic acid and the membrane again promptly disappeared; I then treated the throat with ferric chloride in glycerine and the throat became much better and the patient stronger and seemingly better in every way for about two weeks, but he could not take sufficient nourishment. Yet he seemed to be doing fairly well when suddenly one day he began to get worse and in less than four hours was dead. The last hour of life he gave forth the peculiar odor of uremic poisoning. I think death due to the accumulation of toxins which suddenly made themselves manifest similar to the manner in which diabetic coma manifests itself.

Case 2. Night roundsman on police force, 32 years old, came to me with a history of having had slightly sore and swollen tonsils for a number of weeks; not severe but annoying. I cleaned out the crypts in the tonsils and treated them with pure oil of cassia, twice daily. The patient seemed to be doing nicely and recovering when one morning, about two weeks after treatment began, white patches showed up on the tonsils. As the membrane was easily removable but that it reformed by noon, I had an examination made for Vincent's angina and found the organisms present. I treated this case with monochloracetic acid, followed with ferric chloride in glycerine and the case made an uneventful recovery. As soon as the patient was well enough, I removed the tonsils which were badly degenerated and the patient has been well ever since, with no sign of a recurrence and walks his beat every night.

I have had a few more cases, all of whom recovered. I have had this one death and yet I wonder if Vincent's angina is a clinical entity or a secondary infection?

Ely Block.

FURTHER EXPERIENCES WITH THE BECK-PIERCE TONSILLECTOME.*

DR. HOMER DUPUY, New Orleans, La.

Almost two years have elapsed since recording my experiences* with the Beck-Pierce tonsillectome. An enlarged experience, covering some one thousand cases, has served to re-emphasize that this method of tonsil removal certainly seems to approach the ideal operation, which must seek to enucleate the whole tonsil, *leaving behind the greatest amount of aponeurotic tissue*. A fold of this aponeurotic covering forms the so-called capsule of the tonsil.

The smaller the amount of such tissue that remains attached to the tonsil after its removal, the more perfect becomes the operation, for then we have left a protective covering for the muscles forming the walls of the sinus tonsillaris.

The striking advantages offered by the instrument and the method are that we can, with a single instrument, in a few minutes, enucleate a tonsil with the least amount of traumatism, and therefore lessen post-operative inflammation. This means as an end-result fewer such legacies as cicatricial contractions with distorted pillars, and consequent palatal and pharyngeal deformities.

It is proposed to briefly consider such items as technic, hemorrhage, reaction and age, in the light of my personal experiences.

Technic. In the main, the tonsil is lifted from below upward into the supratonsillar region. A bulging mass now presents itself to the outer side of the ring of the tonsillectome. We then gently push this mass through the ring, keeping the index finger as a fulcrum on the everted tonsil. We then bring into action the wire snare which further separates the tonsil from its surroundings. We sometimes modify this procedure by using, as practiced by Sluder, the hump of the lower jaw (the alveolar eminence) as a fulcrum. The tonsil is pushed through the ring, as previously described. With its cryptic surface protruding through the ring, we then draw the mass down and jam the outside of it against the alveolar eminence, where the everted tonsil is firmly held while the snare completes the enucleation.

We have learned with increased experience that it is absolutely necessary to work with two-sized rings, the small and the medium, if we would succeed in removing 95 per cent of tonsils by this

*A Study of Five Hundred Tonsil Enucleations, with the Beck-Pierce Tonsillectome, Southern Medical Journal, May, 1916, page 453.

method. The small ring is especially necessary in the enucleation of the small (lymphoid) and friable tonsil. Even the medium-sized ring would fail us with such a tonsil, which is the one usually present in very young subjects. In fact, once we have perfected our technic, from the instrumental point of view, it might be stated that the ring is seldom too small and oftener too large.



Fig. 1. First step. Lifting and pushing the tonsil against the upper end of the anterior pillar and the supratonsillar fold.

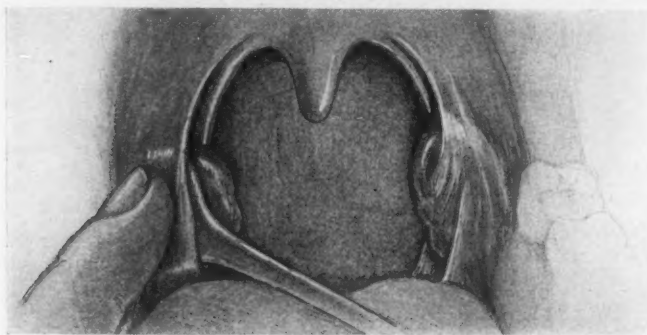


Fig. 2. Second step. Pushing the cryptic surface through the ring with the right index finger acting as a fulcrum.

Ambidexterity is essential, for we reverse our position on either side. The right index finger pushes the tonsil through the ring on the right side, the left index finger is used for the same manipulation on the left side.

Hemorrhage. It is a reiteration of my former experience to state that the hemorrhage is unquestionably greatly reduced by this method. True, we practice ligation for undue oozing and on a spurting vessel. This is simply a routine practice, for my attitude in tonsil surgery is to take no chances.

If we would still further lessen the bleeding, it is advisable to draw the wire snare slowly through the base of the everted tonsil. We have tried MacKuen's suggestion of placing a snare over the everted tonsil, between it and the rim of the Beck-Pierce instrument. We see no special advantages in encumbering an already overcrowded field of operation with more instruments. Thus far we have adhered strictly to the original instrument.

Reaction. We are still impressed that the reaction, locally and constitutionally, is notably less than by any other method. This is just what we should expect. The possibility of destruction of such structures as muscles and mucous coverings of the pillars is reduced to a minimum. Sufficient aponeurotic covering remains behind to leave a smooth fossa free from exposed muscle tissue. The channels for local and systemic infections are then closed, and as a rule there is very little post-operative disturbance.

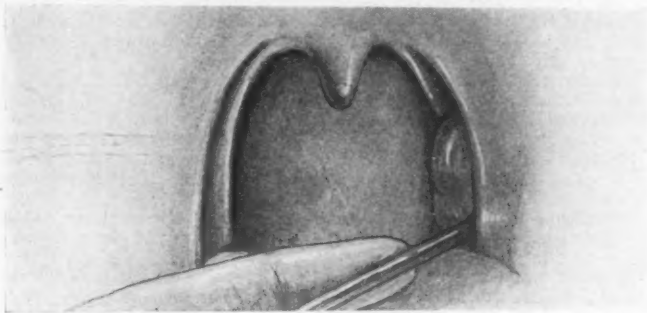


Fig. 3. Using the left alveolar eminence as a fulcrum after the tonsil has been pushed through the ring.

Age. When recording our first five hundred operations by this method, the majority of our subjects were between the ages of three and ten years. The successful enucleations represented about 85 per cent. Practice and improved technic now increases this percentage to 95 per cent.

We were then not impressed with the adaptability of this instrument in adult cases. Further experience, however, using general, and more frequently local anesthesia, has greatly increased our happy results. In many instances, even submerged tonsils were removed with a minimum of reaction. After all has been said, even on the question of age, it seems largely a matter of perfected technic whether or not we can successfully remove all varieties of tonsils with the Beck-Pierce tonsillectome.

124 Baronne Street.

DEPARTMENT OF MEDICO-MILITARY ACTIVITIES.

ABSTRACT FROM THE SURGEON-GENERAL'S LETTER ON THE RECOGNITION OF SECTIONS REPRESENTING SPECIALISTS —SECTION OF SURGERY OF THE HEAD.*

The specialties which form this group are Ophthalmology, Oto-Laryngology, Brain Surgery and Oral-Plastic Surgery of the Face.

The personnel of the Section of Surgery of the Head of each Cantonment Hospital includes one brain surgeon. This assignment is primarily for the purpose of caring for the brain cases occurring in the service of the hospital, and secondarily, to acquaint the surgeon with the methods of management of a military hospital, preparatory to going abroad.

A general surgeon especially trained in plastic and oral surgery is one of the personnel of the section of surgery of the head. He has associated with him as assistants, one dental surgeon, and except in evacuation hospitals, also one dentist. Because of the probable small number of brain and plastic and oral cases in the Cantonment Hospital, the surgeons of these two divisions will assist each other in caring for their respective cases. In the special building for the Section of Surgery of the Head there are special operating rooms. One of these is set aside for the services of Oto-Laryngology. This room is to be shared jointly by the Oto-Laryngologist, the Brain Surgeon and the Oral Plastic Surgeon. Whenever the Brain Surgeon and the Oral Plastic Surgeon need instruments not in the Oto-Laryngological equipment, they are to be obtained from the general surgical equipment.

The surgeon in charge of Plastic and Oral Surgery has charge of injuries and surgical diseases of the mouth, and its essential structures, including the bony framework and soft structures of the face, and also of the neck when the major part of the injury is situated above the clavicle.

Exception to this classification is made in injuries and surgical diseases limited to the orbit or its appendages when the attending Ophthalmologist elects to do the work himself.

In injuries and diseases of the external nose and external ear and the accessory sinuses, when the attending Oto-Laryngologist elects to do all the work himself.

In injuries and surgical diseases of the larynx when the Laryngologist elects to do the work himself.

In thyroid diseases, and in special cases of injuries of the peripheral nerves and the spinal column.

The commanding officer or the surgeon in charge of the hospital may delegate such other work to the surgeon in charge of Oral Surgery as the exigencies of the situation may dictate.

In the absence of the Oral Plastic Surgeon, the Dental Oral Surgeon represents the Oral Surgery Division of the Section of Surgery of the Head. The Dental Oral Surgeon is advised to consult the surgeon in charge of the Section of Surgery of the Head in any question that may arise in the appointment of cases or in the Dental Oral Surgeon's relations to the Oral Surgical and General Hospital work.

In cantonments the Dental Oral Surgeon's main work will be detecting and treating focal infections about the gums and jaw bones, of which there will be a great amount. There may not be enough Oral Surgery to fill all of the Dental Oral Surgeon's time, or the Dentist Assistant's time, in which case he will do such other work as the Surgeon may delegate to him.

J. C. GORGAS,

Surgeon General U. S. Army.

* From letter to Committee representing The American Laryngological Association, The American Otolog. Society and the American R. L. and O. Society.

Major George M. Coats, Philadelphia, is at Base Hospital, Camp Sevier, Greenville, S. C.

Dr. William H. Haskin, New York City, has been commissioned Captain in the M. O. R. C., and has been assigned to the Military Academy at West Point, N. Y.

Dr. Harold Hays, Dr. Samuel J. Kopetzky and Dr. Gerhard H. Cocks are in France.

A military training school in Plastic Surgery of the Mouth and Face has been established at Washington University Medical School, St. Louis. Major V. P. Blair and Dr. H. W. Loeb are in charge of the courses.

Capt. James R. Peabody, Louisville, Ky., has been ordered to Post Hospital, Fort Monroe, Va.

Major John F. Culp, Harrisburg, Pa., has been ordered to Base Hospital, Camp Hancock, Augusta, Ga.

THE DOCTOR'S CONTRIBUTION

In this world's war, your service is absolutely essential.

The medical officer bears the same relative position in war as in peace in that he is a conservator of health and life.

Through his skill, thousands of men receiving slight casualties, are returned to the fighting force, thus conserving the physical strength of the army.

In Base, Field and Evacuation hospitals, doctors are as essential as in civil institutions, where the sick and injured are cared for.

As regimental surgeons and on transports and in the Sanitary Corps, must the Government have doctors if we are to terminate this war successfully.

Your contribution to your country at this critical time is *your service* which you can give for the period of the war as an officer in the Medical Reserve Corps. That your country needs you, is best answered in that she is calling you *now*.

The fighting forces are constantly expanding and such expansion calls for additional doctors and even with the troops now in training and under mobilization (about two million) the Surgeon General has not enough doctors to fill the requirements.

Secure an application blank at once; fill it out and present it to your nearest Examining Board. Do not live to regret that you did not have a part in your country's great struggle for democracy which means *Liberty*.

THE FULL SACRIFICE

Our Country is at war. Men are called according to their talents and training to enter the different branches of the Service. Physicians always have a special place, and those of special training are even more fortunate. No choice has been left to youth because its strength and enthusiasm are asked for by law. Men of mature age have the glory of choice. They choose to serve or let others serve. For the moment the enemy is at a distance, and those without imagination see him always there. The lack of a disaster within our gates makes us feel secure. Many, therefore, are putting off the day of service. Many hesitate and question; some even bargain.

To relinquish liberty causes not a few to shrink back. Yet, those who have taken themselves apart and made the decision and are now doing the duties assigned to them as well as they may, cherish as dearly as the heart can, the liberty to be with wife and family, to continue to engage in private or public medicine, to carry on their investigations, to teach in hospital or medical school, and to provide for their old age. The right to these blessings of peace belongs to no one man. Some there are, however, who by actions or words seem to claim a right to these blessings over their brothers.

No work is too small in a cause nearly sacred. Some have thought otherwise. But whoever is above the work which naturally falls to him, and works, if at all, only with reservations, misses the finest inspiration that duty fully done can supply. He who consciously or unconsciously allows self to decide in this matter is to be pitied. The spirit of service, which, if allowed, would almost transfigure him, he has failed to grasp. Greater peace can no man have than he who has made the full sacrifice.

SOCIETY PROCEEDINGS.

ABSTRACT OF THE SCIENTIFIC PROCEEDINGS OF THE THIRTY-NINTH ANNUAL CONGRESS OF THE AMERICAN LARYNGOLOGICAL ASSOCIATION.

Held at Atlantic City, New Jersey, May 28, 29, 30, 1917.

EMIL MAYER, M. D., Abstract Editor, New York.

The president, Dr. Joseph L. Goodale, after expressing his appreciation of the honor conferred on him, said:

This year we meet at a time when the thoughts of all are centered upon our entrance into the great war. Aside from the fact that lesions of the upper air passages are especially frequent in the present war, both from the character of the missiles and from the use of asphyxiating gases, observers have noted a great increase in inflammations of the nose and throat, spread by contagion among the numerous masses of men in modern trenches.

The contributory causes are the prolonged stay in the trenches, the dampness and want of ventilation in the dugouts, together with the defective light, in which the virulence of micro-organisms is increased, or at least the bactericidal influence of sunlight and fresh air is absent. These conditions appear to favor not only the spread of acute catarrhal infections, but also of cerebrospinal meningitis. The importance of stamping out foci of this latter disease has suggested the desirability of examining recruits with reference to the possibility of their being carriers through lodgment of the meningococcus on the mucous membranes of their nasopharynx. Disinfection of the mucous membranes of carriers has been successfully accomplished by placing the individual in a chamber containing a certain percentage of chloramine vapor for a few minutes. The procedure is said to cause but slight irritation to the mucous membranes, but seems to have almost a selective action on the micro-organisms in question.

Some sections of the line appear to be especially unhygienic, and numerous cases occur of infection which in ordinary life are rare, such as perichondritis of the larynx and primary laryngeal tuberculosis. Latent systemic disease is prone to be lighted up—such as tuberculosis and syphilis. Bleeding from the nose, trachea and bronchi, at times of an alarming extent, often occur. In albuminuria, fatigue and cold are apt to bring on glomerulonephritis, a not infrequent symptom of which is edema of the glottis. The unfavorable influences are increased by the difficulty of changing clothing, transportation in open vehicles, and by rapid changes of temperature.

Direct laryngoscopy has proved its value in locating traumatic lesions.

Secondly, may we not then profit by an examination of the writings of those who are now endeavoring to indicate some of the errors of judgment and conduct in matters of education and research?

In illustration of past deficiencies in this respect may be cited the fact that for many months the English authorities, while rigorously excluding from Germany such articles as saltpeter and cotton, nevertheless were permitting the exportation of lard from this country in large quantities, in ignorance that it is the source of glycerin, and consequently a prime requisite in the manufacture of explosives.

We must, therefore, recognize that as nations court destruction for want of science, so our profession in America runs the risk of being outstripped by that of other countries unless it rests upon an equally secure foundation of scientific training with all that this implies.

Another matter which I wish to present for your consideration is the slackening up of scientific work in allied countries in the early part of the war.

We should differentiate between those educators and investigators, on the one hand, whose position permits an advantageous deflection of their activities into channels capable of rendering a direct national service, and on the other those individuals who, by reason of their age, lack of physical qualifications, or from the nature of their work, may regretfully feel that they must stand aside without a definite service to offer.

Such men are capable of making a very real contribution to the nation. It is for them to uphold the best traditions of their past, to maintain without faltering their customary work of teaching and investigating, and to present to their comrades whose good fortune it may have been to participate more directly in military service, on the return of peace, a definite record of having kept undimmed each in his own chosen field the light of education and of research.

Further Observations Upon the Use of Radium in Diseases of the Upper Air Passages. DR. D. BRYSON DELAVAN, New York.

From a report by Dr. Ewing and Dr. Janeway of the Memorial Hospital in New York City, an institution devoted to the study of cancer, the writer presents a summary of one hundred and eighty-four cases of cancer of the upper air passages out of a total of four hundred and twenty-two cases.

The successful cases given in the report of cancer of the mucous membranes are illustrative of the best service that radium in the light of our present knowledge can perform. In the majority of them the lesion was small and probably operable, but for some reason operation was deemed inadvisable or was refused. While all show complete clinical retrogression, this—from the point of view of those who only consider as cured those patients who are well after three to five years—may not be an absolute cure. The proof must be left to time.

In advanced cancer, any temporary benefit from radium is usually overshadowed by the later progressive extension of the disease. No patient of this class should be given treatment which will be followed by more than transitory discomfort.

To summarize a few after-points made in the report which seem to carry special weight:

Knowledge of the use of radium is making steady progress.

The work of but one year in a single institution shows a marked advance.

As with surgery as applied to carcinoma, so with radium, for the best results are gained by the prompt treatment of early cases.

The question at once arises as to how long it will be before the use of radium will be proved worthy to supplant surgery.

DISCUSSION.

DR. CHARLES W. RICHARDSON, Washington, D. C.: I have had very unfortunate results after the use of radium in five cases which I recall to mind—four of cancer of the tonsil, and one of cancer of the cheek. They have all died. The cancer of the cheek was discovered very early.

Now, these and the other two cases, which were later, all died in the usual course of time.

There is, however, one thing to be said in favor of radium in the treatment of these cases, and that is the wonderful relief it gives of all of the disagreeable symptoms. As they went along their course these cases did not look like extensive malignant disease of the tonsils, as we usually see them. There was very little odor and the lives of the patients were fairly comfortable and free from pain. One died from hemorrhage, and the other three from toxemia, and this toxemia came on one week and the next week they passed away. It was all very quick, and they were apparently in good health except for the local condition. Until the time of toxemia they were interesting in that way, that they were all very much more comfortable, but they all four were fatal, and fatal in about the time they would have been without any treatment at all.

DR. ROBERT CLYDE LYNCH, New Orleans: I have four cases in my experience now, one of which I believe is definitely well. It is a case that has apparently been cured—at least the patient has had no recurrence for eighteen months. He received no benefit at all from the action of the radium until the radium was put in the laryngeal cavity through a tracheotomy tube. Seventy-five milligrams of radium and screened over with a milligram of pure gum rubber was left *in situ* for eight hours, tied into the larynx by means of a catheter, and put in through a tracheotomy tube passed through the mouth, the radium slung between two strings, the lower string tied to the tracheotomy tube and the upper string to the teeth. In that way the radium was brought into actual contact with the diseased tissue. This was one of the cases that had a recurrence after dissection by suspension, and that recurrence has entirely subsided and the voice returned, and he is apparently well—that is, he has been well for eighteen months at least.

In another case operated upon with a third recurrence it was thought to be perfectly inoperable, and the application of radium to this area caused perfect and complete subsidence of every evidence of the recurrence. It is now six months since this application, and apparently there is not the slightest indication of any recurrence of this metastasis to the second side. In this instance again we were able to supply the radium actually to the site involved, and I wonder whether inability to secure any results in the laryngeal areas is not due to the fact that the cartilage must act as an interceptor to some of the rays, or influence the action of the radium within the laryngeal box.

DR. E. FLETCHER INGALS, Chicago: A patient came to me from a distant state with a growth in the pharynx running perpendicularly. It was about one and a half centimeters in its various diameters and about three or

four centimeters long; that is, it extended from the upper pharynx down to the arytenoid cartilages. I could not tell how much farther. The patient came with a history of not having been able to swallow for some time, and was much emaciated and in an extreme condition. The effect of radium in this case was something marvelous; the growth simply melted away. At the end of about eight days the tumor had all disappeared, but there was a large ulcerated surface that represented the base of the growth; and the most remarkable thing was that the ulcerated surface completely healed, so that within a short time one could not even see the scar. When this growth had disappeared I found that the patient still could not swallow, and then I was able to determine that she had cancer of the esophagus lower down. I passed a catheter down to the obstructed point, measuring the distance, and then placed the radium in the catheter and, measuring the distance, passed it down into the stricture. The result of the first application was to open up the stricture very decidedly, and a later application opened it up so that the patient could swallow very well. However, in one of the earlier applications the throat was burned so that it had the appearance as though it had been burned with boiling water or a hot iron. It became very sore and there was considerable sloughing. The patient had a great deal of discomfort for ten or twelve days; however, the burn finally healed.

DR. J. PAYSON CLARK, Boston: I want to add my testimony to what Dr. Richardson said in regard to the value of radium treatment in relieving the symptoms, especially the symptoms of pain. I was very much impressed with the relief which was obtained in swallowing by patients who had before suffered a great deal.

DR. LEWIS A. COFFIN, New York City: I have had a little experience in the last year with radium. I had become thoroughly discouraged in its use and the effects from it. However, we are glad to get anything that adds a ray of hope to forlorn cases.

In one of my cases all the symptoms were very much relieved. The woman could not swallow at all when she came to me, and shortly afterward she was eating fairly and greatly relieved. But the glands softened up somewhat, and we thought it well to open those glands and let out the broken down tissue and put the radium in those glands and left it there all night. The woman, however, began to lose ground and she soon died.

Another patient had a growth in the epiglottis, and a pathologic examination showed it to be malignant. In that particular case it was just like adding manure to soil: the growth was very much stimulated and it grew more rapidly than if we had not used radium.

DR. BURT R. SHURLY, Detroit: I am enthusiastic enough in the use of radium to feel that it is our duty at least to use this method of treatment in all cases of malignancy where we so thoroughly understand that surgical methods are not sufficient to accomplish results.

I operated on one case which involved the soft palate, the upper jaw and the antrum from time to time—three operations in all—and after each operation there has been a very slow recurrence. During the past three years we have used radium at intervals of from three to six months, and the radium has been passed up into the antrum after the antrum operation and held there by the use of soft, pliable copper wire which will bend in any direction.

Another case that I have had which has now been going on for about three years. By a series of applications of radium his case has undoubtedly been prolonged and been benefited, and what looked to be a very speedy fatal issue has turned out to be a slow process that has now continued for three years.

I do believe that radium has a very decided field of usefulness, but there is a great deal in the scientific application of it, and in the dosage and method by which it is applied. It is a field within itself, and we should have an expert who will help us in that branch of the work and upon whom we can call at any time.

DR. EMIL MAYER, New York City: I would like to have the reader of the paper in closing give us some statement as to what class of cases have done best. It is very possible that we may innocently do some harm to the patient in our attempts at making a diagnosis. Ought we not, therefore, learn of the experience of those who have followed these cases and found that perhaps it may be that those cases have done best where the diagnosis has been made clinically, and no previous attempt made to remove a part of the growth for microscopic examination to prove the diagnosis? Is it not possible that that stimulates the recurrence of the disease? If we can have that made clear, it does seem that we may be able here to formulate some positive distinct rule as to the method we may adopt with safety.

DR. HARMON SMITH, New York City: I believe the good results that are obtained from the application of radium lies in the fact that practically all tumor growths vary in their virulency, and that those cases which are benefited by radium are less virulent than those cases which go on in their natural process of malignancy to a fatal termination.

I am associated with the same institution as Dr. Delavan, and I have sent a number of inoperable cases there—patients upon whom I had previously done a tracheotomy. This is an institution where every facility is available for properly applying radium in advanced cases, and each case went progressively on to death. In addition to these cases, I have sent two cases of retrolaryngeal fibroma, and one went on to death. In the other case there was such burning and excoriation of the mouth that we had to feed the man by rectum for a week, and instead of retarding the growth, it became accelerated and involved the cheek. This was an angiofibroma.

DR. NORVAL H. PIERCE, Chicago: Based upon his experience, the speaker believes that while a growth may show the characteristics of carcinoma under the microscope, it may vary greatly in malignancy.

At the present time there must be an enormous number of these cases, and I cannot see that we have arrived at any particularly well defined opinion regarding the beneficial effects of radium, even at the present time. I can only state that my experience with radium has been, in a broad sense, disappointing.

Within the past two years I have had three cases of carcinoma of the superior maxilla involving the antrum, and without exception they have gone from bad to worse, although every means of applying radium has been followed, even to perforating the antral wall and putting a capsule of radium immediately into the growth. True, the pain has been diminished and the odor has decreased, but the disease has swept on as though nothing had been done.

I believe that if we depend upon radium for a cure in the early stages of laryngeal carcinoma, we will have about as much effect beneficially or otherwise, in the large majority of cases, as we would have if we depended upon faith. We only waste time.

I have had a case recently in which we split the larynx and applied the radium without cutting away the growth, a case of leucoplakia laryngis, where I had observed the patient for four years. This leucoplakia was situated on both vocal cords. The leucoplakia remained unchanged for four years. Suddenly from one of these plaques on the right vocal cord, the posterior third, a swelling began—a fusiform swelling covered by mucous membrane—and a well marked cauliflower-like carcinoma developed. The larynx became very much inflamed, and the last I heard of the patient was that there was a probable recurrence of the growth.

The only possible chance for cases of carcinoma of the larynx is thorough removal by external means at a very early date, no matter how early. Whether we apply radium or not is immaterial; otherwise in extensive carcinoma the only means of safety is a thorough operation, and by that I mean laryngectomy.

DR. JAMES E. LOGAN, Kansas City: I believe if the suspension method is used and a local application of the galvanic cautery is made directly to the growth, comprehending or taking in all of the growth so far as is feasible, that we will have accomplished practically all that we could accomplish, if not more, than in an application of radium.

If we are to judge from the literature pertaining to the subject, there appears to be very little, if anything, in the use of radium for such cases.

DR. JOSEPH BECK, Chicago: It is about fourteen years since I started the employment of what I thought was radium in diseases of the upper respiratory tract, and only about five or six years ago did I find out (and then reported with negative results) that practically no radium was contained in the capsule that I was employing. So far as I am able to learn from the literature on the subject, too little radium was employed, and then when an amount, say one hundred and fifty to two hundred milligrams, was left *in situ* for a period, it burned the structures beyond repair, so that the remedy was worse than the disease. My results are absolutely negative as to cures of deep-seated growths; I will not even say of far advanced cases, but of those which I would ordinarily class as operable. When radium was employed in such cases the ultimate result was either laryngectomy in time to save the patient, or a fatality.

If Dr. Mayer would have us treat cases without touching the growth, it does not seem to me it would add anything. We will not know what we are treating. This does not appeal to me. If we do not have microscopic examinations of the growths we are treating, it seems to me the subject would not advance very far.

DR. D. BRYSON DELAVAN, New York City (closing the discussion): The work which is being done at the Memorial Hospital in New York is very far in advance of anything that I know of that has been done anywhere else, and for that reason I have taken the liberty of presenting this resume of that work.

In this report I mentioned, the hospital gives you the results of its work along this line. It is the best they have been able to do in three years' time with a very considerable number of cases. When more years have passed they will have thousands of cases, but their attitude in treat-

ing these patients is purely experimental—time will give more definite results, or at least more conclusive results, whether better or worse.

Of all the cases treated, there are a total of twenty-two which are believed to have fairly retrogressed. That means twelve per cent of the one hundred and eighty-four cases. There are also seventy-nine cases which have improved, which is a total of about forty-three per cent. There are also seventy-nine cases unimproved. This makes a total of fifty-five per cent supposed to be improved, as against forty-three per cent unimproved. In cancer of the esophagus, stomach, etc., the statistics are just about the same.

The method must be adopted to the case, and the ingenuity of the one managing the case must play an important part in the selection of the means of application.

The device of Dr. Robert Abbe is simple, ingenious and very effective. It is intended for the application of radium to the more remote recesses of the body, and is especially useful in the larynx and pharynx. It can also be introduced in any part of the upper nasal cavity, which is extremely difficult to reach by any other method.

There is another thing which has come to be used in the treatment with radium, and that is an obturator like a plate for artificial teeth, extending backward to the site of the growth and furnished with grooves in which the radium can be placed to the location desired.

As to the hopelessness of cancer of the throat—it is pretty hopeless. The cases all die. We do not get the true statistics of surgery of the larynx. You cannot get them—no one will give them to you; but if you should get them, you would have a pretty ghastly record. Perhaps it might, therefore, be just as well to exercise a little patience toward radium until we find out what it can do, and look forward with a ray of hope meanwhile to cheer the men who are working very hard to perfect it.

An Endolaryngeal Removal of an Unusually Large Lymphoangioma from the Larynx, with Complete Recovery of the Patient. By CHARLES W.

RICHARDSON, M. D., Washington, D. C.

(To be published in a subsequent issue of THE LARYNGSCOPE.)

DISCUSSION.

DR. J. M. INGERSOLL, Cleveland: I had the privilege of seeing this case before it was operated upon, and was very much interested in the report.

I think that it took considerable courage for Dr. Richardson to determine whether or not the growth was an angioma by incising it. I discussed the case with him then, and we both wondered what the outcome would be, and were suspicious of malignancy. I never had seen anything like it before. The end result is very favorable.

DR. EMIL MAYER, New York City: These cases are especially interesting. One particularly important thing is that the trained eye of the laryngologist sees at once that the diagnosis that is so often made in nearly every one of those cases is wrong, and that the cases are not of a malignant nature. I can picture for myself the view that Dr. Richardson had of that patient, with a proper light, where he at once concluded that the original diagnosis of malignant disease which had been made was wrong. I believe that we can in most instances make a diagnosis macroscopically.

I must congratulate Dr. Richardson on his courage in putting in a knife to see if it was a bleeding tumor, and also on his successful removal of

it intralaryngeally. The growth itself differs from most of the others on record, in that it was partially external and partially within the larynx. It is very remarkable that a patient with so large a growth should be able to get along without a great deal of dyspnea. To my mind a case of this kind would be ideal for suspension. With very little effort one could draw the growth into a snare and remove it, and if necessary cauterize the place. In the case I reported a year ago the operation was done externally, and the growth was removed and the mucous membrane sewed over. I am confident that that was the only way the case could have been treated, for the reason that it was below the false cord and not above it.

DR. HENRY L. SWAIN, New Haven: Some of those present may recall a case in which I removed a tumor in the same manner as Dr. Richardson did, the report of which appeared in the Transactions for 1892. This growth, however, was lower down than it was in the case of Dr. Richardson, and it still holds the record for size in strictly intrinsic growths of the larynx. The growth was in the anterior commissure, and began only slightly above the place where the two cords come together, so that more of the base of the tumor was below than above. When the patient came into my office one could see nothing but the growth upon expiration, but during inspiration this tumor would move down so that the air could get by it. The patient had been living in that way with a very hoarse voice and with difficulty in breathing for nearly two months. He ran for a trolley car and fell down and was nearly asphyxiated, and relating that to me as I looked down into his larynx, I trembled at the idea of getting the tumor out. I had no idea of the up and down dimensions of the tumor; the diameter as I looked down upon it was just what would fill the chink of the glottis, but the vertical dimensions were three times the horizontal dimensions. I told the man that if he was a good soldier I would try to take it out. He consented and I put cocaine in, and taking a snare got a good hold of the tumor twice. I tried to get the tumor out but failed. The man was getting blue in the face, but I put on a whole lot of power and got it out. I was more scared when it was finally out than I was before. It was a tremendous growth, much larger than was apparent to the eye, and still holds the record for size. I was prepared for the eventuality of hemorrhage, and told the man to throw himself forward with his head down, hanging over the end of the couch. He minded exactly as he was told, and hardly a drop of blood came away. He came back again on the third day and one could see then where it had been, just above the vocal cord. The patient had no recurrence. Dr. Richardson's specimen is a monster and the result of his skill is most gratifying.

DR. CHARLES W. RICHARDSON (closing the discussion): I wish to add just one word to Dr. Ingersoll's remarks, a point which he did not make quite clear. We were a little suspicious of the malignancy of this growth—in fact, we could not quite eliminate the matter from our minds—before we had the result of the pathologic findings.

Report of a Case of Carcinoma of the Larynx Treated with Radium. DR. ARTHUR W. WATSON, Philadelphia.

A physician, about seventy-three years of age, came under my care November 24, 1914. There had been increasing hoarseness for a year,

without inflammatory symptoms, pain or cough; the general health was good, the general history was negative.

Examination of the larynx showed a smooth, red, sessile growth or swelling on the left side beneath the vocal cord, extending from the anterior commissure backward about one-half the length of the cord, and downward from the cord about one-half inch. It seemed to involve the under surface of the cord. Movement of the anterior half of the cord was restricted, which caused bowing in phonation. The growth was sharply defined and the other parts of the larynx appeared to be healthy. A clinical diagnosis of carcinoma (epithelioma) was made. For obvious reasons a microscopic examination was not made.

When first seen the growth was one that could, undoubtedly, have been removed by laryngofissure, but in consideration of the age of the patient and the fact that he was in favor of trying the effect of x-ray or radium, it was decided not to operate.

The radium was applied to the outside of the larynx; eleven milligrams radium, filtration one millimeter of lead, and one and one-half inches of gauze, for three hours. This was repeated in February (six treatments, 198 milligram hours). March 1st the radium was increased to twenty milligrams, filtration one milligram lead, one-half inch gauze, applied for three hours. This was repeated (six times, 360 mg. hours). March 17th began forty milligrams radium, filtration same as before, applied for three hours. Repeated (six times, 720 mg. hours).

Various applications were made, none of them satisfactory, and it had to be abandoned. The external application of the radium again instituted in the following dosage. Forty milligrams radium, filtration one millimeter lead and one-half inch gauze, applied five hours July and August (in all, nineteen applications, 4200 mg. hours).

September 23rd, about one month after discontinuing the radium, it was noted that the growth was apparently gone, left vocal cord a little slower in movement than the right, skin inflamed over larynx.

On the second of April, 1917, the patient returned with hoarseness, which he had noticed for a month or more. Examination showed a small nodule beneath the edge of the left vocal cord near the anterior commissure, the site of the old trouble. Radium was again used, a few days later, forty milligrams, for twelve hours. The larynx was examined two weeks later. The growth was found to be smaller, the neck inflamed April 25th, only a slight thickening remained. The voice was again almost normal. The same condition was present when last examined.

From the results that I have seen in suitable cases, and with a better knowledge of the dosage, better results may be expected, especially if the radium can be applied from within the larynx, which would be made easier by a tracheotomy.

DISCUSSION.

DR. ROBERT C. MYLES, New York City: It is a question to be solved, whether in the early stages of incipient cancer it is best to immediately remove the cancerous mass with the adjacent tissues, and if it recurs to use radium, or whether it is best to use radium without microscopic

examination. In this connection it would seem best to consider to what extent we would advocate either procedure if the growth was in ourselves. Judging from personal experience and observation, it is my belief that the average person who has a growth, or symptoms of a growth that is probably malignant, defers the question because they do not like to have it decided that they have one, and hope against hope that nothing will be found. There is unnecessary delay caused by that attitude of mind.

As far as the secondary or tertiary conditions of cancer are concerned, it seems to me to be unwise not to use radium for the hope it offers in the relief of pain and odor and the other phenomena connected with malignancy.

I think it was Dr. Mayer who made the remark earlier in the morning that we should first try to cure the patient and leave the scientific diagnosis unsettled. On the other hand, this is not conducive to progress; again, I do not know whether we can improve the physical conditions of a case which experience has shown us is malignant, by microscopic examination, nor do I see what the chances are of it being nonmalignant by resorting to such examination.

DR. HENRY L. SWAIN, New Haven: I am very glad that we have heard this paper, first because it was a model in the way it presented the dosage, method of treatment, length of treatment, etc., and secondly, because it left us with a spirit of hopefulness.

This is again the case of the old, old story. We went through all this with the x-ray. We had in our hands a powerful means, the possibilities of which we knew nothing, and we learned by exchanging experiences in the various meetings all over the country that x-ray burns were produced, that we must use a filter, that we had to have adequate dosage, if we were going to get results. We are now doing the self-same thing with radium. In exchanging these experiences now, it seems as if we ought to come to some conclusions. I think one thing is clear—that we should not putter around with other means, and if we are going to use radium, we should get at it early. Inadequate dosage is worse than nothing. On the other hand, we must not use such a tremendous dosage that we either kill the patient or the surrounding tissues.

DR. E. FLETCHER INGALS, Chicago: I am under the impression that the dosage here is quite as important as in giving strychnin; that is, if you give too large a dose it will do a great deal more harm than if nothing had been given. If we read the reports of the men who have used radium, we will find that there has been in some cases great destruction of tissue from which some patients have finally died. Some patients can tolerate larger doses than others. It appears to me that radium, x-rays and sun's rays act practically in the same way: they burn in every direction where they can reach, unless properly screened. All the weaker tissues burn out first; but if the dose is a little too strong, the normal tissues will burn out at the same time. If this is correct, then the dosage is by far the most important thing; it must be worked out carefully. I tested each individual patient—a small dose at first, and repeated, according to its effects.

DR. ARTHUR W. WATSON, Philadelphia (closing the discussion): What

I wished to bring out was the question of dosage. I am of the opinion that if the dosage is too heavy, so that the normal tissues around the growth are destroyed, cicatricial tissue is produced in which the malignant disease may more readily be reproduced. It seems to me that this may be the reason for failure to cure the disease in some cases. But I believe the best way of getting at the proper dose is by regarding what has been done in each case, instead of considering one application of radium the same as another.

Tuberculoma of the Tongue. DR. CARL E. MUNGER, Waterbury Connecticut.

Male, aged thirty years. The patient's tongue presented a crater-like cavity situated on the dorsum, at the junction of the middle and posterior thirds, in the median line, the prebase of the tongue. At the bottom of the crater was a marked ulceration covered with a yellowish slimy secretion, and from the central ulceration were narrow, sharply-marked ulcerations radiating to the circumference of the thickened and indurated mass. The surface of the swollen mass was yellowish in color, and there was marked and exquisite tenderness upon the slightest pressure, with much pain at every movement of the tongue. This pain was localized and not radiating when the tongue was at rest. There was present also the condition known as nigrities.

While the tubercular ulcer may be primary or secondary, a primary tubercular lesion of the tongue is extremely rare; although a few cases of tubercular infection of the tongue following traumatism have been reported. Speaking generally, the tongue is more often inoculated from the lungs than the lungs or larynx from the tongue.

The case reported presented a marked deviation from the usually reported situation of tubercular lesions on the tongue, which have almost invariably been stated to occur either on the tip or sides, this one being on the dorsum, a site on which we usually find a gumma.

The prognosis is not dependent upon the lesion itself, but is influenced alone by the fact as to whether the patient is suffering from concurrent lesions in other parts of the body which are not susceptible to improvement, or is he suffering from pulmonary tuberculosis, where there is a tendency to fibrosis? If the latter is the case, there is a fair degree of certainty that the tongue lesion may heal without local therapy, but if the pulmonary process is acute, with caseation and necrosis active, there is little chance of the tongue healing.

DISCUSSION.

DR. BURT R. SHURLY, Detroit: In a service of one hundred and fifty beds during the past six years in a tuberculosis hospital, we have had two cases of tuberculous ulcer of the tongue. Both of these occurred in a far advanced condition. I have yet to see, in my experience, a primary tuberculous larynx or a primary tuberculous ulcer of the tongue. Invariably, those cases have shown some other activity somewhere, if it is looked for sufficiently and thoroughly. These two cases suffered the most terrific pain and had progressed so far that there was absolutely no chance of curing the patients. We simply cauterized the ulcerations and

made use of orthoform and other measures for relief, in the hope that they might be able to have a little more comfort and take some nourishment. In all these cases it seems to me that we ought to determine the relative frequency of bacilli. By this means the diagnosis is proved and syphilis is excluded. What seems to me marvelous is that we do not have some ulceration on the tongue, from the fact that the mouth in these advanced cases is absolutely alive with swarms of tubercle bacilli.

DR. THOMAS H. HALSTED, Syracuse: Seventeen years ago I removed the tonsils of a girl of twelve years, which were tuberculous. A year or two afterwards a surgeon removed the cervical glands of the neck, which were tuberculous. Two or three days later she developed a mastoid and in the course of that developed a localized pachymeningitis. We thought it was tuberculous meningitis and expected her to die, but she recovered. Later on, in the course of two or three years, she developed tuberculosis of the phalanges, and one thumb and one finger were both operated upon by a general surgeon. She then developed tuberculosis of the nasal mucous membrane, which I curetted and applied lactic acid for a number of months. Then she developed a tuberculous ulceration of the alveolus, which must be now four or five years ago. Later, within the past two years, she has developed tuberculosis of the nasal septum, and the tuberculous process has extended so that now it involves the tip of the nose, and it looks as though she will lose the tip of her nose. This girl, during this whole period, has been a seamstress, and is of course living a fearful life, with a great deal of pain in the mouth and tongue, but she is very hopeful for some new means of a cure. She feels that ultimately she will get well. In spite of all the disease processes, we have never been able to discover anything in the lungs. The diagnosis has been made through scrapings and the findings of the bacilli. The very interesting thing about this case is the long duration of the disease and the number of lesions which have developed in various parts of the body.

DR. HARMON SMITH, New York City: I do not think this was a tuberculous ulcer. It was in the median raphe, away from the border of the tongue, where irritation of a tooth would make an ulceration. It was a fertile field and one where tubercle bacilli would grow.

We should not confuse tuberculous fissures of the tongue and tuberculous ulcerations of the tongue with tuberculoma. It was about the location of the taste breakers in the median raphe.

Serial Frozen Sections of the Thorax from a Case of Aneurism of the Aortic Arch. DR. GEORGE FETTEROLF, and DR. GEORGE W. NORRIS, Philadelphia.

The main points of interest in this report are as follows:

1. Photographs of the patient obtained at various periods during life showed successive steps in the growth of the protruding mass.
2. Frozen sections were made of a case which had had careful clinical study, and, as a result, conditions as they had existed in vivo could be accurately reproduced and deliberately studied after death. Search of the literature reveals the fact that this is the first opportunity of this kind which has arisen and been taken advantage of.
3. The exact site of rupture, and the cause and mode of death, could

be determined and depicted with a degree of accuracy, certainty and detail which would be impossible of attainment in an ordinary autopsy.

4. The hydrothorax, the pulmonary atelectasis, and the extreme dyspnea are explained in a manner which by any other method of study would have been much less satisfactory, if at all possible.

5. The last statement is equally true of the anatomic relations. The altered position and general changes in the bronchial tree and other thoracic contents are depicted in such a graphic manner as to show to the laryngologist and internist alike what does take place in the presence of such a lesion as this large aneurism. It also suggests what may take place in some of our future clinical cases in the presence of other disturbers of the normal intrathoracic relations.

DISCUSSION.

DR. GREENFIELD SLUDER, St. Louis: The labor in presenting Dr. Fetterolf's material is exceedingly great. We are constantly dealing with disturbances that seem trivial, which, if we bear in mind the relations within the chest, are frequently separated and put into a more serious category. It has been my experience within the past three months to, as it were, pick up two aneurisms of the aorta by virtue of dislocation of the windpipe, recognized in the laryngeal mirror, and a number of times I have outlined the same dislocations within the mediastinum, depressions of the windpipe, as a means of recognizing mediastinitis. Sometimes they are not of tubercular origin; more frequently I believe it to be tubercular. In one case that proved exceeding desperate, the infection was a primary tracheitis, going on for a length of time with mediastinitis and depression of the windpipe.

Stereoscopic Roentgenograms of the Head. DR. J. M. INGERSOLL, Cleveland.

The longer we have used the stereoroentgenograms, the more certainly have we been convinced of their practical value, for they give us definite information in regard to the nose and the nasal accessory sinuses, the brain and many of its blood vessels, the ear and the mastoid, which cannot be obtained in any other way. The size and boundaries of the maxillary and frontal sinuses can be distinctly seen. If there are any septa, tumors or foreign bodies in these cavities, they can be accurately located and defined. The ethmoidal and sphenoidal sinuses overlap each other, and are thus somewhat masked, but their position, relative to each other and the orbit and the other surrounding structure, can be clearly distinguished.

Skill in interpreting the roentgenograms can be more easily acquired by the surgeon than by the roentgenologist, for the surgeon has the decided advantage of being able to verify and correct the findings in the roentgenogram while he is operating. If the surgeon will carefully study the stereoscopic pictures before operating, compare his interpretation of the picture with the condition which he finds in the operation, and then study the picture again after the operation, he will soon acquire great skill in interpreting the stereoscopic plates.

In studying stereoscopic plates they should be examined from both sides. First, put the plates in the stereoscope with the film sides toward the mirrors. This will show the structures as we see them in the opera-

tion, with the external parts in the foreground and the deeper structures in the background. Then by reversing the plates in the stereoscope, turning the smooth sides of the plates toward the mirrors, the structures will be seen from the inside of the skull.

The technic for making stereoscopic anteroposterior radiographs through the frontal sinuses is described, as also the technic for making stereoroentgenograms of both mastoids on a single pair of plates.

These plates, when developed, are placed in the stereoscope, with the one having the right eye images in the right light box of the stereoscope, and the one having the left eye images in the left light box. With the glass side of the plates turned toward the mirrors of the stereoscope we view the mastoids from the inside of the skull, while with the film side of the plates placed toward the mirrors we view the mastoids from the outside of the skull.

DISCUSSION.

DR. ROBERT C. MYLES, New York City: Dr. Ingersoll has demonstrated it is much better than most of us believe it to be, and the topographic anatomy is shown better by this method than by any I know.

DR. HANAU W. LOEB, St. Louis: It is really amazing how much more one gets to know about his work by studying one after another of the stereoscopic plates in every case which shows a disposition toward suppuration in any of the sinuses. It makes a man much better, even if he does not find in any particular case any essential value in the exposure. Taking the whole thing together, he develops an understanding of the subject far beyond what can be obtained by any other method.

The beauty of this work is that you can look at a case from before backward, or behind forward, by simply turning the plate around.

DR. LEWIS A. COFFIN, New York City: I just want to say in regard to the stereoscopic picture that there is no question but that more interest and more knowledge is to be gained from it. We must remember, however, that a doctor often sends a patient in from twenty, forty or fifty miles, and unless he can come down where we have such an apparatus he cannot see the results. There are times, therefore, when he must put up with the other picture, which is more or less helpful. We cannot always have the stereoscopic roentgenograms.

Lantern Slides Showing Normal and Diseased Sinuses of Children from One to Fifteen Years of Age. DR. LEWIS A. COFFIN, New York.

Dr. Lewis A. Coffin showed a double series of slides from x-ray plates of children's heads from one to fifteen years of age, one series showing normal and the other diseased sinuses. He said that one of the interesting things connected with the getting of the plates was the fact that nearly all the plates showing disease had been obtained from x-raying the heads of children from an eye ward of the Manhattan Eye, Ear and Throat Hospital without selection, that practically any case in that ward showed sinus disease, and he believed that this was strong presumptive evidence of the dependence of many eye conditions on the diseased accessory sinuses.

He called attention to the frequent involvement of the antrum, and stated that in this condition he saw the frequent cause of atrophic rhinitis and, practically the universal cause of true ozena.

(To be continued.)

